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Notes of the Month

SIMULTANEOUS DYEING AND RESIN FINISHING NOW A PRACTICAL PROPOSITION

THE intriguing prospect of being able to resin-finish cloth at the same time as it is dyed becomes a firm reality with the announcement from I.C.I. Dyestuffs Division of their development of the "Procion-Resin" process. The outstanding technical merits of the Procion reactive dyes are already widely known. In the new process they are applied in conjunction with commercially available resin precondensates to give dyeings claimed to be markedly superior in fixation and colour value to dyeings obtained by any established techniques. The dyed fabric at the same time acquires all the benefits normally associated with a resin finish, in particular, improved crease recovery properties.

The economic benefits of this revolutionary two-in-one process are obvious. The separate dyeing operations are completely eliminated, since the Procion-Resin process follows the sequence of a normal resin finishing treatment, namely: pad, dry, bake and wash-off. The essential difference is in the addition to the pad liquor of the dissolved Procion dye and the special Procion-Resin Catalyst A. The processing technique is exactly the same as in conventional resin finishing, with the sole proviso that the treatment shall be carried out carefully, with particular attention to proper maintenance of an adequate temperature at the baking stage. The final washing-off of unfixed dye is easier because of the greatly improved fixation, and the new process produces the required shades at a lower dyestuff cost, especially in the case of deep shades.

The principle behind the Procion-Resin process is as simple as its operation. Procion dyes, as is known, react with cellulose under alkaline conditions, this being the principle of their application to cotton and viscose rayon. Under acid conditions they will react with polymers containing basic groups, and this forms the basis of their application to wool and nylon. They will also react under acid conditions with nitrogen resin precondensates, giving a stable chemical linkage. This fact, and the great similarity between Procion dyeing procedure and the sequence of operations followed in resin finishing, have been cleverly exploited by I.C.I. dyestuffs technicians to devise the new two-in-one process. The process has been exhaustively tested in the laboratory and the results have been confirmed in large-scale trials.

The Procion dyes of the cold-dyeing type are, in general, those most suitable for application by the new process, although selected dyes from the less reactive Procion "H" class are also valuable. Precise details are given, along with full information on the process, by I.C.I. Dyestuffs Division in Technical Information No. 546, which also specifies the recommended resin precondensates and gives details of the more important fastness properties of the resulting dyeings. The important technical and economic advantages of the Procion-Resin process, and the fact that it is operated in existing plant by well-established procedure, cannot fail to arouse the active interest of dyers and finishers in the high-class cellulosic piece goods trades.

PROGRESS IN MARKETING JUTE PRODUCTS

GOOD marketing plans for jute products were of growing importance, said Mr. A. S. Kyle, retiring chairman, at the recent annual meeting of the British Jute Trade Federal Council in Dundee. After referring to the improvement in sales of jute goods during the past year, Mr. Kyle said: "As a widely-used industrial fibre, jute has responded closely to the more active trading conditions generally. If other industries are busy then it is normally a fair assumption that jute will be busy. But that is only a general assumption and when we come to survey the future it would be unwise to think in terms of an assured market for our products. Among natural textiles, it is true that jute has been least affected by the advance of man-made fibres. Indeed, some of the latest advances in soft floor-coverings are composite constructions of jute and man-made fibres and offer new possibilities for the future. But in certain other fields there is a constant change in fashion in industrial needs, and we find competitive interests devoting much energy and money in developing ideas with a view to assailing established jute markets. This presents a great challenge to us and we must let it be known by performance that we are more than equal to the battle.

"On the production side, our performance in re-equipping our industry in recent years has been second to none. It is now up to us to demonstrate that our ideas and performance in marketing are on an equal plane. Our way ahead is undoubtedly linked with this vital challenge and, in my view, it can only be met by the utmost co-operation between manufacturer and merchant. We must see to it that more emphasis is placed on getting information back from the ultimate user of jute goods as to his special needs and problems. We must increase our efforts to anticipate developments so that we are not merely abreast of the times but ahead of them. We must also make the most of opportunities of any new outlets. Fortunately, in enterprise of this kind, we have now at hand on a trade-wide basis the growing volume of knowledge accumulated by the scientist."

Mr. Kyle reported that a total of over £11½ million had now been spent in the post-war modernisation programme of the Dundee jute industry. Expenditure on re-equipment during 1959 was £477,000. As in 1958, this was below the annual average for the whole period, as a

result of political uncertainty. Additional capital commitments (£540,000) entered into at 1st January this year, however, were already greater than the actual expenditure in 1959. In his speech, Mr. Kyle said the future of the jute trade in this and other countries greatly depended on wise policies being pursued by Pakistan in the growing and marketing of raw jute. An internal change of government in that country had been followed by an outward-looking interest in world jute affairs. The Pakistan Jute Enquiry Commission had recently visited Great Britain and the Continent. It was hoped that sound long-term policies would emerge from this interchange of views and open up a new era of stability and progress for the world jute trade.

SCOTTISH TWEED EXPORTS

EXPORTS of Scottish tweed in 1959 were 25% higher than in the previous year, it was announced at the recent annual meeting of the National Association of Scottish Woollen Manufacturers in Edinburgh today. Dollar earnings alone rose from $9,560,000 to $12,360,000. Sales totalled 10,177,000 sq. yds. valued at £8,099,000 compared with 8,125,000 sq. yds. valued at £6,697,000 in 1958. Deliveries to the home market also improved—by more than 1,000,000 sq. yds.—and total production amounted to 21,868,000 sq. yds. of which 46·5% was exported. Production in 1958 was 18,787,000 sq. yds. Dealing with results in different markets, the president, Mr. John Ballantyne, said: "While exports to the U.S. are much better than in 1958, they are still 25% lower than in 1956 when the tariff quota was first imposed late in the year. Meanwhile, the Japanese and Italians have increased their sales enormously. In 1959, imports of Japanese cloth into the U.S. were nearly double those of 1956 in spite of a self-imposed quota, and that from Italy nearly four-and-a-half times as great. This illustrates the crazy effect of the quota."

After paying tribute to the "tremendous amount of work done in this tariff quota war" by Mr. J. Douglas Hood (chairman, National Wool Textile Export Corporation), Mr. Ballantyne continued: "The difficulty now seems to be to persuade our own government that renegotiation of this tariff is urgent. If delays are allowed to occur we may well be faced with a quota again in 1961. If that were to happen we might lose a lot of dollar customers for good." It was a pity to say the least that the government apparently refused to recognise that the British wool textile industry was one of the best earners of foreign exchange for the country.

The other areas which concerned the Scottish tweed industry considerably were Western Europe and Scandinavia. "Last year the common market countries took 23% of our exports, which was an increase," he said. "The free trade association countries took only 8·2% which was a decrease. That emphasises the fact that our best customers in these two groups are in the common market. One might think that we stand to lose more than we may gain when the duties within the two groups are considerably reduced, but one must remember that our present competitors in the free trade association countries are mainly from the common market. We are not therefore so badly placed as these figures indicate, though it is important for us that the two groups should get together. If that were to happen some of our European competitors might find us tough competition in their own countries," said Mr. Ballantyne.

The report of the Council of the Association states that Scotland appears to have more than held her own in the American market compared with the rest of the British woollen industry. While sales of Scottish cloth rose by nearly half as much again, those of Britain as a whole increased by only 25%. "Our 7% of loom power again accounted for more than one-fifth of American imports of British cloth," comments the report. In Canada, sales also rose—from 824,000 to 989,000 sq. yds.—but this increase was not nearly so marked as in the U.S. All records for sales to Western Europe were broken, deliveries to Western Germany, Holland and Belgium being far ahead of all previous years, though business in Scandinavia was "disappointing." The leading export markets for Scottish woollen cloth during the year were (in thousands of sq. yds.): U.S.A. 3,119, Canada 989, Western Germany 666, Japan 390, Holland 337, Italy 312, Belgium 297, and Sweden 229.

WORLD TRADE IN WOOL AND JUTE

ACCORDING to figures published today in the March issue of the Commonwealth Economic Committee's *Wool Intelligence*, world exports of wool tops set up a new record in 1959, when they reached 240 million lbs. or about one-fifth greater than in the previous year. In the final quarter of the year, though, there were signs that the rise had begun to level off. The U.K. remained the largest single supplier and her exports rose by 8%. Particularly striking improvements were recorded by West Germany, Japan and South Africa, while the more traditional producers, like France, Belgium and Australia, showed increases of between 15 and 30% each. China continued to be the world's largest buyer, though imports into that country dropped by about an eighth last year to some 27 million lbs. Raw wool imports also rose in 1959. The fourteen major wool importing countries of the free world bought about 22% more raw wool last year than in 1958. The total came to over 2,600 million lbs., actual weight, and is believed to be the highest ever recorded. The largest proportionate increase occurred in the U.S., where there was a 50% rise; Japanese imports were up by over a third and the U.K. showed a 14% improvement, while the six common market countries together registered an increase of 16% on 1958.

The changing pattern of the U.S. wool cloth import trade since the introduction of the tariff quota system in 1956 forms the subject of a special article. The analysis shows that while imports from the U.K. have fallen by a quarter over the past three years, the volume of cloth from Japan has doubled and that from Italy has risen four-fold, making the latter country the leading supplier of the American market. Even after last year's quota at the low tariff rate had been filled, the proportion of total imports coming from Italy continued to rise significantly. A possible explanation of this situation may be the changes which have taken place in the average value of imports from the main suppliers; in 1956 Italian cloth averaged $1.80 per sq. yd., a shade cheaper than the U.K. cloth and a little dearer than the Japanese, but by 1959 the declared value of Italian cloth had fallen by 58% to $0.76, at which price it was less than half as dear as either the U.K. or the Japanese material.

World output of jute manufactures in 1959 is estimated to have been 2% greater than in 1958 at nearly 1·9 million tons. Output in India was about 1% down on the previous year but in Pakistan, now the second largest producer, it is estimated to have risen by a third. Among European producers there were moderate increases in output in the U.K. and Belgium, but France and West Germany showed reductions.

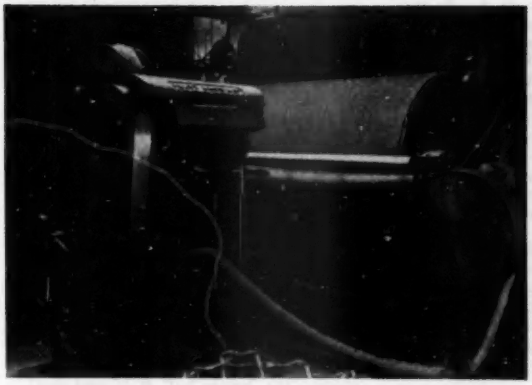

Plate I. Showing side-drawing of sliver "rope" and its entry to the balling machine

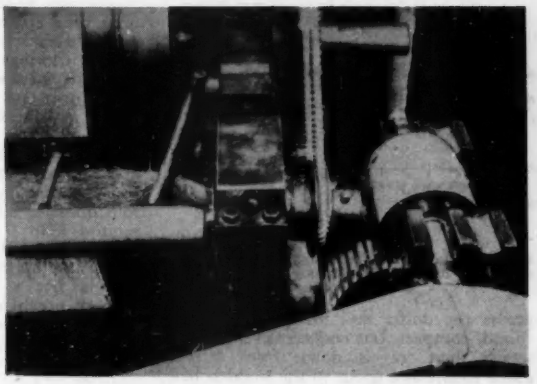

Plate II. Close-up of revolving funnel and draw-off rollers

The Ball and Bank Feed

The ball and bank feed consists of two parts—(a) the balling machine located close up to the face of the delivery doffer and (b) the bank or creel extending the full width of the card and standing a few feet from the feed rollers of the machine

By J. A. B. MITCHELL*

AS one of several forms of intermediate feed available for woollen cards the ball and bank is not so widely used in the industry and in consequence is not so well known as, say, the Scotch cross-feed. Nothing very definite is on record as to when, where, and by whom it was devised, but it has for long been associated with the carding plants of the Scotch tweed trade, and even today is more Scottish than the cross-feed. In principle the ball and bank resembles the derby doubler of the cotton industry, from which it was probably derived. According to an early writer† the original form had either a centre-draw (for better parallelism of fibres) or a side-draw (for better mixing), the twisted "rope" of carded wool from either pattern being caught and stored in a deep can.

A number of full cans were arranged in front of the intermediate feed board and the wool "ropes" led side by side into the feed rollers. In any case the ball feed, in its present form has for many years been very popular in the Scotch tweed trade, not only as a server mechanism connecting scribbler and intermediate, but also between intermediate and carder parts, more particularly at an earlier period when the single ring doffer or single stripper condenser was extensively used for fine Cheviot and Saxony yarns. In fact the bank-fed single-cylinder carder with this type of ring doffer condenser may be regarded as being traditionally a Scottish set-up, though with the increasing adoption of the tape condenser in more recent times the Scotch feed has replaced the ball and bank as a final feed on many of the typical three-part sets in Scotland. Yet it still retains its popularity as a means of serving the Intermediate, especially for colour mixtures. Incidentally, the majority of the existing text-books which deal with woollen carding make only a brief reference to this form of feed, while a few contain serious errors when describing its construction and working as to convey to the reader a totally wrong impression of its capabilities for levelling and mixing.

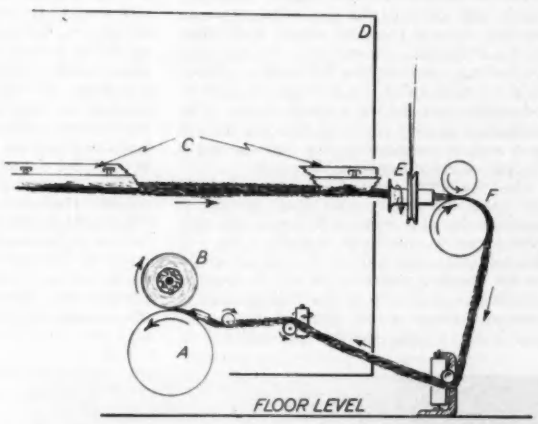

Fig. 1. Elevation of partly carded material being drawn to the side and passed through the "roper"

The ball and bank feed is an intermittent or non-continuous form and consists of two parts, viz., the *balling machine*, which is located close up to but across the face of the delivery doffer, and the *bank* or creel extending the full width of the card and standing a few feet from the feed rollers of the machine. Only a narrow passage separates balling-head and bank so that the floor-space occupied between scribbler doffer and intermediate feed rollers is no more than required for, say, the Scotch or Apperley types and considerably less than that required for the old Blamires lap feed.

The partly carded material, removed from the scribbler (or again at the intermediate) doffer D by fly-comb C is drawn to one side and passed through rotating funnel or "roper" E, then between the "draw-off" rollers F. The revolving funnel imparts a slight twist so as to gather the mass of fibres, assist in their passage

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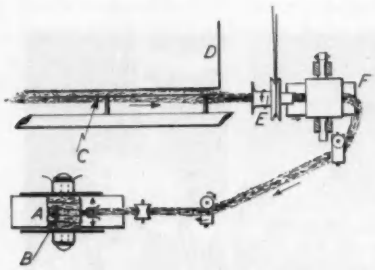


Fig. 2. Plan view of carded web being removed from doffer through "roper" and draw-off rollers

across the doffer and form them into a round, compact, but endless sliver "rope" which then travels down from F via guide rollers and spout to the wooden ball or spool B (4 in. wide × 3½ in. dia.) driven by contact with the winding drum A as in Figs. 1 and 2. Tremendous pressure is brought to bear on the ball as it builds up by the manner in which it is held and weighted while in the running position. The drum (15 in. dia.) is driven by belt and two pinions from the shaft of the bottom draw-off roller at a speed consistent with the delivery rate so as to maintain sufficient tension on the "rope" while the latter passes to the balling machine.

When full each ball carries 100 to 120 yds. of rope representing about 2½ to 3 lbs. carded material, depending on the weight per unit length of the "rope." The coils are compactly built and wound in close spirals across the width of the ball which is held on a detachable spindle between large metal side-plates. Normally each ball carries the same length, controlled by a registering wheel, and when full is replaced by a new one. In one make of balling machine the full ball is ejected and its place taken by the next in a series of empty ones held in a chute above. The attendant merely retrieves the ball thrown out and is responsible for maintaining a supply of empty ones in the chute.

In the Platt and Richardson balling machine the empty ball B is placed in position by the minder between the side plates on a duplicate spindle (Fig. 3) diametrically opposite to the one presently in the winding position. When the correct length has been run-on the balling head is rotated through a half circle clockwise on centre X. In this manner the full ball is brought to the top while the empty one is moved into contact with drum A. At the same time a cutter arm moves forward to meet the sliver rope hanging from the full ball as it swings through 180°. By means of this device the rope is cut and the end is folded over and tucked in at the nip of A and B thus resuming the winding of a fresh ball. The attendant removes the full one, by withdrawing the spindle on which it is carried, at the same time replacing it by an empty one. Usually a ball takes 7 to 8 mins. to fill so that the scribbler will require 8 or 9 hours to prepare a full complement of 60 or 72 balls for the bank before the intermediate card can start, but this is not a serious hindrance when properly organised and working to capacity. This feature, associated with the intermittent nature of working, will be discussed later.

Capacity of Bank

The bank consists of an upright frame facing the feed rollers of the following machine. The frame supports four pairs of wood rollers arranged one pair above the other. At equal intervals across the width rods are strung from top to bottom of the framework, thus dividing it into a series of pigeon-holes in each of which a ball is placed with the rim resting on the rollers. A bank of 60 balls will have four tiers of 15, while a 72 end bank will have 18 balls in a row.

The balls in each row are driven by contact with the two bank rollers so as to unwind the "rope" each holds. The four lines of ends converge at a "heck" or raddle H positioned about 12 in. in front of and on a level with the feed rollers as shown in Plate VI and Fig. 4. Each ball sliver passes through the appropriate division in the heck before entering the nip of the intake rollers R. and R^1. The 60, or more, ropes, flattened by pressure during building, lie side by side under some tension as they pass along a platform to the feeders. The usual arrangement is to have one ball per inch of card width, e.g. 60 balls for a machine 60 in. wide on wire.

The bank rollers are driven by an upright shaft and bevels from a horizontal transmission shaft geared to the feed rollers so that any alteration in speed of the latter by change-wheel will always turn the bank delivery rollers at a rate in sympathy. By following out the lie of the fibres from the side-drawing to the winding and unwinding of the sliver "rope" it will

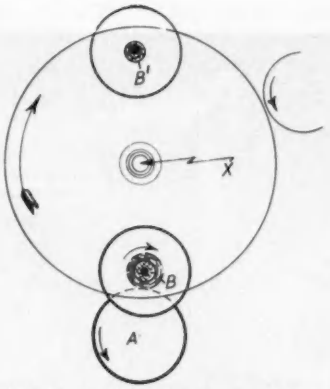


Fig. 3. In the Platt and Richardson balling motion the empty ball B is placed in position between the side plates on a duplicate spindle

be seen that the bank presents the fibres (at least the majority) "end-on" and not crosswise as in the Scotch feed. Due to this feature, aided by the compactness of the material when in the form of baller "rope," and from the fact of the slow, controlled, entry to the feed rollers, the flow of fibres to the Swift, via the licker-in, is very regular.

As a feed to the intermediate card in a three-part set the ball and bank type offers two striking advantages, viz.:—

(1) Good mixing and levelling power.
(2) A means of correcting an "off-shade" batch during carding.

Secondary features, regarded by some users as worthwhile, are the "end-on" presentation of fibres to the next machine and also better control over the flow of material entering the feed rollers.

Uniformity

In regard to number 1, the bank type is probably far in advance of any other, although concerning this feature it has to be admitted that the order of merit or the grading of the various feeds in use has never been established by experiment. The product of the intermediate card, if served by bank feed, particularly when assembled as a "rope" for a second balling head, is the aggregate of 60 to 72 ends which enter the card side by side and are merged by the action of the card rollers before being side-drawn across the face of the delivery doffer.

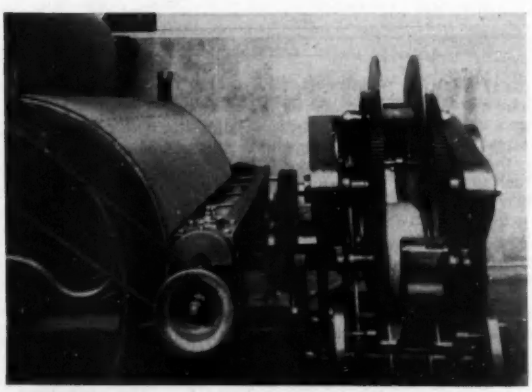


Plate III. Platt's balling machine before changing, showing empty spool (top) waiting and full ball (bottom) in winding position

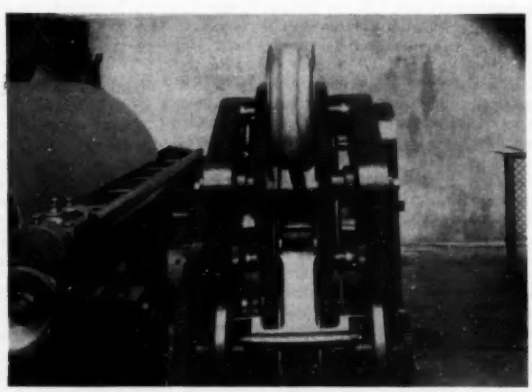
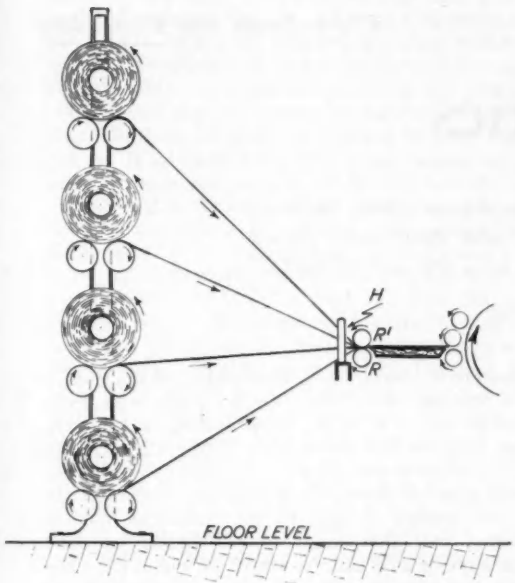


Plate IV. Same after changing. Full ball awaiting removal and cutter-in action



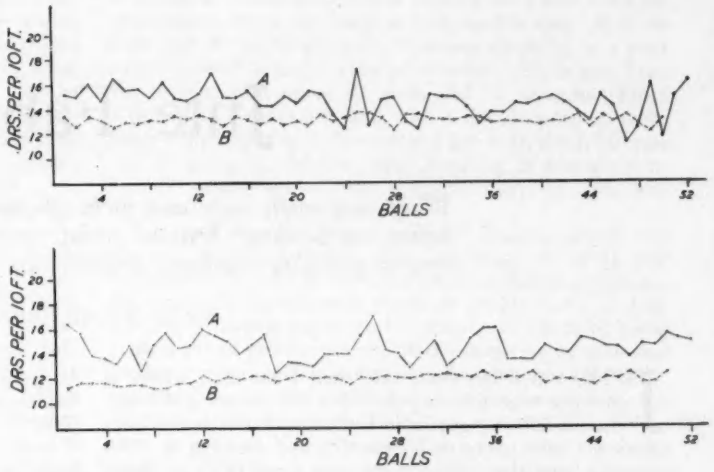


Fig. 4 (left). Each ball "end" is led through the heck to the feed rollers

Fig. 5 (above). Weight of 10 ft. of "rope" from the outside of each ball in a series of approximately 50 from the scribbler and from the intermediate following it

In effect the endless web of fibres, 60 ins. wide, is diverted through 90°, caught and compressed into a continuous band 7 or 8 ins. wide when a Scotch feed connects intermediate and carder parts, or is gathered up into an endless roll or "rope" when a second ball and bank follows.

Consider a double-cylinder scribbler, 60 ins. wide on wire, whose last doffer, 30 ins. dia., is travelling at 6 r.p.m. and forming baller rope which is being drawn off at 45 ft./min. This means that the flimsy web of fibres from an area of 235 sq. ft. is being rolled up into spiral folds to form 45 lineal feet of sliver rope, or 1 ft. of rope from roughly 5 sq. ft. of the doffer surface. Later this one "end" from the bank occupies and serves 1 in. of card width on the next machine.

The intermediate card cannot start on the batch until a full complement of balls is prepared by the scribbler which, as already stated, is almost a day's work. When all are in position in the bank each ball "end" is led through the appropriate division of the heck H, over roller R (R^1 having been temporarily removed) and along the board to the nip of the feeders as shown in Fig. 4 and plate VI. When threading-in is finished R^1 is replaced and any slackness in individual ends is taken up by winding back the ball.

The first yard or two of "rope" unwound from the outside of the ball is soft, round and bulky, unlike the remaining length which is flattened and compressed as a result of the high pressure applied during building. This tends to give a slight over-delivery from each ball and in consequence lessens the tension on the ends during the first few minutes of the run after starting with a fresh set of full balls. Because of the slight change in bulk density of the "rope" between the layers near the core and those at the perimeter of a full ball, combined with the fact that the arc of contact of ball with rollers decreases, it is generally found that the resultant sliver, or even the condenser slubbing, becomes lighter in weight per unit length as the bank runs down. At the intermediate bank this may be partly nullified by arranging two rows of full balls to be run with two rows of half-filled ones, or by working with one ball short of the full complement for the first stage of a batch then adding it to the bank during the rundown from midway.

The graphs in Fig. 5 show the weight of 10 ft. of "rope" from the outside of each ball in a series of approximately 50 from the scribbler, and again from the intermediate following it in the same set. In each case graph A represents "ball to ball" variation in weight per unit length of baller "rope" from the scribbler, while B shows the same from each of 50 produced in sequence from the intermediate when served by the former series. It is obvious that the aggregation of so many at the bank has resulted in a baller "rope" being decidedly less variable from the intermediate. The fact that the weight per unit length in B is lower than in A in both instances is the outcome of re-adjustment in the rate of feed at the intermediate so as to reach the particular count of slubbing at the condenser, but this difference in no way affects the capacity for mixing and levelling.

(*To be continued*)

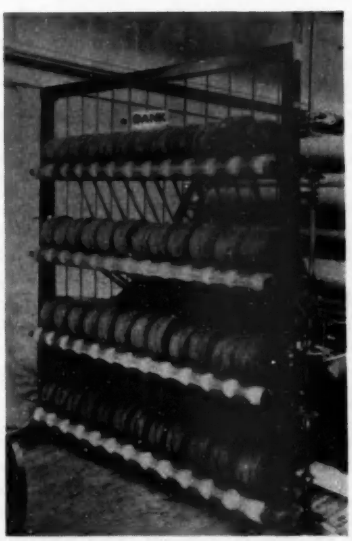


Plate V. General view of the bank

Plate VI. Close-up showing the "ends" from the bank entering the intermediate. (Note the two black ends for shade correction of the light grey ground)

Jute Fabrics

Warp and weft, ends and picks of plain weave cloths such as baline, tarpauling, hessian, scrim, etc., also twills and fancy weaves including mattings, brattice cloth, etc., and carpet fabrics

By W. MIDDLEBROOK

JUTE, which has been cultivated from early times, is another vegetable or plant fibre like cotton and linen, the plant being grown in India and Pakistan and both countries have many mills spinning and weaving it. The name is from the Indian vernacular name *jhōto* or *jhuto*; *jūta* means braid of hair. Jute yarns are coarser than linen, and are used chiefly for such rough materials as sacking and bagging; simple weaves are used for most jute fabrics, the plain weave being called a *hessian*, just as a plain weave in cotton is called *calico*. Simple twills are used, such as 3-end and 4-end, and herring-bone twills from a combination of left- and right-handed twills; fancy weaves are confined chiefly to the carpet industry.

Plain Weaves

Baline, a coarse canvas used by tailors for linings and by upholsterers for coverings, is made of jute as well as linen; *paddings* also are used by tailors and dressmakers for coat padding, a heavily stiffened fabric made with two ends lifting as one, dyed black or left in its natural colour. A typical jute *padding* is made with a double warp, of 9s counts, and 10s weft, 14 ends and picks/in. *Buckram* is another tailoring and millinery fabric, being stiffened with a paste of china clay and glue, and used for stiffeners; one example of the jute variety has a single warp of 8s, 8 ends per in., and 6 picks/in. of 10s weft. A well-known jute fabric, used for hayrick covers, wagon covers and the like, is *tarpauling*; a double warp is used for this plain cloth, one example being 8s warp and 20s weft, 16 picks/in., an 18-porter sett and 4 warp ends per dent in the reed, making about 40 ends/in. The porter system in the jute trade is based on 20 reed dents or splits per porter on the basis of a 37 ins. reed.

Vine netting is really an open-work fabric, used for covering fruit trees and similar work, a single warp plain weave of 8s jute yarns and from 4 to 6 picks/in. and 4 ends/in. Another loosely woven fabric, though not in the same class as netting, is *arras cloth*, a dyed material used for curtains, table and cushion covers; the name comes from the town of Arras, where in the fourteenth century a coarse material for hanging on walls—originally called *opus saracenium*—was made. Where *arras cloth* is generally associated with wall coverings, *drugget* is used for floor coverings, especially as a protector for carpets; this coarse fabric, which may be of linen/wool, coarse cotton or jute, gets its name from the French *droguet*, which really means "inferior stuff, rubbish or trash." The same sense is found in English with the expression "a drug on the market"; in the sense of an unsaleable commodity, this phrase was first used of unwanted or unsuitable cotton goods.

Wrapping materials of plain jute include such fabrics as *burlap*, *pack duck* and *hessian*, though the latter is also a bagging materials; *burlap* is a corruption of the Dutch boenlap, a rubbing clout. *Hessians* are made with from 7 to 10 porter setts, 7s to 10s warp and 9s to 12s weft, 2 ends per dent, an average quality having 12 ends and picks/in.; the name comes in a roundabout way from the old German state of Hesse. It is said that Great Britain hired Hessian troops to fight in the American War of Independence, and that these troops carried in their *baggage* the larva of a destructive wheat fly which has since caused great havoc in American wheat crops, the fly being known as the hessian fly. *Checked hessian* may be made with 8s warp and weft, 12 ends and picks/in., and is used for mattress covers. *Gunny* is another jute cloth used for wrapping cotton bales and for bagging, a fabric woven in Dundee and Bengal that takes its name from India, *goni* meaning "sacking or a sack."

Pocketing material, usually a 2×2 twill weave when made of cotton, has a plain weave for the jute fabric; *fine pocketing* has a double warp of 10s yarn and from 15s to 18s weft, 12 ends and picks/in. *Jute rug backing* is another plain fabric, using 3-fold yarns in warp and weft, with a single warp of 3/8s and 3/10s weft, 8 ends and picks/in. Several plain jute fabrics are used for making bags and sacks. *Bagging* may have a single or a double warp, with 2 ends per dent for one and 4 ends per dent the other, one example being 8s warp and 30s weft, 10 ends and picks/in., used for coarse bags. *Cotton bagging* has a single warp of from 8s to 12s yarn, 4 to 7 porter, and from 200s to 400s weft with from 2 to 5 picks/in., making an open fabric used for baling cotton. *Fine hessian*, used for biscuit bags, is a much firmer cloth, having as many as 20 picks/in. of 6s weft and 20 ends/in. of 6s warp.

Jute scrim, also known as *onion pockets*, has a plain weave, being used for onion bags; one example has 8 ends and picks/in. of 8s warp and weft. This fabric is sometimes pasted on paper to make a strong waterproof material; *paper cloth* is a similar fabric of jute or hemp, coated with paper at both sides and processed for box making. *Mending bagging*, used for repairing *cotton bagging*, may have 12s warp and 500s weft, 4 picks/in. and a 5 porter sett; *twist bagging* uses 3-fold or 6-fold yarns, one example having a single warp with 6 ends and picks/in. of 3/8s jute yarn. Other bagging fabrics include those known as *Belgian bagging*, *bin bagging*, *bran bags*, *manure bags* and *ore bags*.

Twills and Fancy Weaves

Sacking is made with a simple 3-end twill weave, one example having a double warp of 10s yarns, 12 ends and 12 picks/in. of 20s weft; the material is used both for wrappers and for making sacks, and the name comes from the Anglo-Saxon *sacc* and the Phoenician *saq*, meaning a coarse cloth. The ends per dent or split vary with different

types of sacking, a 2×1 twill sacking with a single warp having 3 ends per dent, a 2×1 with a double warp 6 ends per dent, a 3×1 twill with a single warp 4 ends per dent and a 3×1 twill sacking with a double warp 8 ends per dent. *Brattice cloth*, the wind screen fabric for mines, may be twill as well as plain weave, the 3-end twill quality having a double warp, 12 ends and picks of 8s warp and 16s weft per in. *Wool packs* have a 2×1 twill weave with a double warp, 10 ends and picks/in. of 8s warp and 48s weft.

Four-end twills are used for *mattings* and *hop pocketing*, *cable matting* having a 2×2 twill weave with a single warp, 10 picks/in. of 36s weft and an 18 porter sett with 2/2/9s warp. *Medium matting* may have a 4-end twill or a fancy weave, with 2/16s or 3/11s warp and from 20s to 36s weft, 10 picks per in. *Heavy matting* is a similar cloth with more ends and picks per in. *Hop pocketing* has a 4-end twill weave with a double warp, 12s to 14s, and from 8 to 12 picks/in. of 36s weft. Heavy jute bag and sack fabrics with a 2×1 twill weave are known as *B. twills* or *Bombay twills*; *New Zealand twills* are bagging fabrics with a 2×2 twill weave; *Brazilian bags*, for the Brazilian rice trade are twilled, as also are *cement bags* and *railway sacks*. *Belgian tapestry*—made in Scotland—is a fancy curtain fabric of jute and flax mixture yarns; *horse cloth* is a heavy twilled jute cloth of the blanket type, sometimes wool backed; *hat cloth*, used for millinery, is made in fancy weaves from 2/4s warp and 6s weft, about 20 ends and picks/in.

Carpets

It seems a far cry from calico to carpets, but this discussion on woven fabrics would not be complete without some reference to jute in relation to the carpet industry. There are several plain-weave carpeting fabrics of jute, including *Brusselette*, *Dutch* and *Venetian carpeting* and *Scotch* carpets. *Brusselette* uses from 10s to 12s warp and weft, 6 to 8 picks/in. and about 12 ends/in.; *Dutch carpeting* has three grades—low, medium and heavy—and is used for stair carpets. The low quality has 2/8s warp and from 36s to 50s weft, 8 ends and picks/in., medium quality has 2/8s warp and from 32s to 45s weft, about 14 ends and picks/in.; the heavy quality *Dutch carpeting* has 2/8s warp and from 30s to 40s weft, 20 ends and 12 picks/in., all with a single warp. *Lobby carpeting* has a double warp, plain weave, 2/6s warp and 24s weft, about 30 ends and 16 picks/in. *Scotch carpets* have a single warp with a double plain weave, 8s to 10s warp and 12s to 48s weft, 30 to 40 ends and 20 to 30 picks/in. *Venetian carpeting* is a stair covering, with a single warp plain weave of 2/5s and from 40s to 60s weft, about 24 ends and 12 picks/in. From 4 to 8-shaft weaves are used with a double warp to make *fancy lobby carpeting*, 2/7s warp and 24s weft, about 20 ends and 12 picks/in. *Medium twill carpeting* is another 4 to 8-shaft weave fabric with a single warp of 2/8s and 12 picks/in. of 30s. weft.

Jacquard figured carpets include *Brussels carpets* and *Brussels cut-carpets*, each with 2/8s warp, 6 to 8½ pile threads per in., and 8s weft, 8 picks/in. *Wilton carpets* are also jacquard figured, with single or double warps of 2/8s, 7 to 9 pile threads per in. and 8 picks/in. of 14s weft, being classed as cut pile carpeting. It is interesting to note that the famous *Wilton pile carpet*, now made all over the world, was developed at the Wilton Royal Carpet factory from the *Brussels* carpet, first made at Wilton around 1701. Before that, as early as 1655, the simple *drugget carpet* was being made in Wiltshire homes for the Wilton factory, the men working the handlooms and the women spinning the yarns. Other qualities since made at Wilton include *Saxony Pile*, *Florentine*, *Venetian*, *Windsor Twill* and *Town Made Mats*.

Axminster carpets, first made in the Devonshire town of Axminster in 1750, have been made at Wilton since 1835. These are made on unmechanised looms, with a huge top roller carrying the jute or flax warp threads which stretch to a bottom roller on which the finished carpet is wound; a number of girls sit in front of this vertical loom and form the pattern by knotting ready-cut tufts of wool to the warp threads. This type of *Axminster* is now known as *real hand made* to distinguish it from machine-made carpets; an even better quality is known as a *Fine Worsted Real Axminster*, this being made with tufts of coloured worsted yarns drawn direct from bobbins and cut to the correct length after knotting, giving a closer weave and a superior carpet. There are power-driven carpet looms at Wilton, each producing one hundred yards of "Wilton" pile carpet a week; but one weaver working a fine quality Real Axminster produces only 9 ins. in a week. One such carpet, made for the Court drawing room, measured 60 ft. by 40 ft., and contained 137 different colours arranged to form the design through the medium of 5,500,000 hand-tied knots.

Technical Literature

FIRE PROTECTION. A new publication by the Fire Offices Committee Fire Protection Association, 31-45 Gresham Street, London, E.C.2, is concerned with the fire protection of buildings and the problems of fire-resisting construction, Entitled "Good Practice in the Fire Protection of Buildings," price 2s., the booklet lists recommendations for types of roof, sprinkler systems, and accessibility.

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PLASTICS TODAY. A recent edition, published by I.C.I. Ltd., Plastics Div., Welwyn Garden City, Herts., contains a number of well illustrated articles. Among these are "The Cathode Ray Oscilloscope," "The Strength of Plastics," and "P.V.C. Flooring."

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HYDRAULIC MACHINERY. A 36-page catalogue from John Shaw and Sons (Salford) Ltd., St. Stephen Street, Salford 3, is packed with photographs, and briefly describes a selection of the wide range of hydraulic machinery they manufacture. Included are a 310-ton revolving box cotton press and a 135-ton pulp steeping press used in rayon or cellophane manufacture.

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1959 BOOK OF THE YEAR. A section of this excellent, high quality example of the printers' art, published by Shell Mex and B.P. Ltd., Strand, London, W.C.2, is devoted entirely to the man-made fibre industry, an industry which Mr. A. J. C. Walters, in his introduction, describes as "growing and changing all the time" and "continuing to give greater choice and variety to the fast-moving civilisation in which we live." The article outlines the growth of "Terylene" and nylon and mentions several newer fibres.

FREIGHT SERVICES TO AND FROM NORTHERN IRELAND. Good communications are essential to modern industry and for Northern Ireland a life-line vital to her growing prosperity. This is apparent on studying the new booklet produced in association with the Northern Ireland Ministry of Commerce. The brochure briefly describes the general cargo services and the freight facilities available on the fast passenger ships which operate from Belfast, Larne and Londonderry to Glasgow, Heysham, Liverpool and Stranraer. Details are given of the container services which carry goods safely and economically from Northern Ireland to destinations within 150 miles of the British ports in less than 24 hours.

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FIRE FIGHTING EQUIPMENT. A combined catalogue and instruction manual from Nu-Swift Ltd., Elland, Yorks., describes and gives instructions for using every one of the range of Nu-Swift fire-fighting appliances. It includes chapters on the design of portable fire extinguishers and on selection of appliances for a specific purposes.

Preparation of "Courtelle" Tops Suitable for Worsted Machinery*

In considering the materials this paper is concerned mainly with the production of standard and high-bulk tops via the worsted system. Reviewing the converters employed, it is pointed out that the Courtaulds-design, Pacific and Rieter machines produce a sliver superior to any from a worsted or roller and clearer card

By W. HARDACRE, F.T.I.†

LARGE weights of acrylic fibres are consumed in the worsted and woollen industries in 100% form, also in blends with natural or man-made fibres, and two principal types of yarn are produced. The first uses the fibre in standard form alone or in blends for weaving or knitting yarns; for example 100% acrylic yarns are used in large amounts in jersey fabric and blend yarns are in use in weaving for heavy or tropical suitings and ladies' dress goods.

The second type of yarn known as high-bulk is used in large weights in the knitting field for outerwear in 100% form and to some extent in blends with other fibres. Special effects can be obtained in woven fabric by using a single unrelaxed high-bulk yarn or by using a two-fold yarn, one single of which is relaxed and the other unrelaxed. Subsequent wet treatment will cause differential shrinkage of the singles and hence an effect yarn.

Acrylics in General

Although there are several sources of acrylic fibre, the main ones in the British textile industry are as follows:—

(1) "Courtelle."—Courtaulds Ltd.
"Orlon."—du Pont de Nemours Co.
"Acrilan."—Chemstrand Corp.

The chief component used in the production of acrylic fibres is acrylonitrile in varying proportions derived from chlorine, caustic soda, ethylene (or acetylene) sodium cyanide and potassium bisulphate. All three types above are available in various staple lengths or as tow for the various sections of the industry. In this paper my remarks are, however, confined to the production of standard and high-bulk tops via the worsted system, from "Courtelle" the first British acrylic fibre. This fibre has been evaluated both experimentally and on full commercial scale in various deniers as staple or tow at Westcroft Mill. In order to take advantage of the improved performance and product of the Courtaulds-design tow-to-top converter over the conventional card, that factory now receives its "Courtelle" acrylic fibre in the form of a 480,000 total denier tow for use in the existing standard

Table 1
Deniers and Staple Lengths of "Courtelle" available

"Courtelle"	2 ins.	2½ ins.	4 ins.	6 ins.
15 denier ..	x	x	x	x
9 „ ..		x	x	x
6 „ ..		x	x	x
4·5 „ ..	x	x	x	x
3 „ ..	x	x	x	x

form on that machine or for production of the high-shrinkage fibre via the Turbo-Stapler. The latter machine incorporates a pair of electrically-heated hot plates which with tension produce the high shrinkage fibre; a similar piece of heat stretching equipment is in use on the Pacific Converter.

Some producers of acrylic fibre already supply a heat-stretched tow commercially, which is a commendable point as I would prefer to see all types of converters in use for the production of high-bulk sliver without the need for ancillary equipment to obtain the high shrinkage component. One advantage of this system is that the high shrinkage portion is the only part of the blend subjected to heat treatment and the physical properties of the remainder cannot therefore be impaired. In the case of the Turbo-Stapler all the tow is heat-stretched first and then 60% of the sliver produced is relaxed. A better fibre diagram is obtained which is more suitable for all types of worsted drawing by using some of the previously mentioned converters rather than the latter. Table 1 sets out the available deniers and staple lengths of "Courtelle," and Table 2 gives the physical properties of "Courtelle" compared with those of a wool fibre.

Table 2
The Physical Properties of "Courtelle" compared with Wool

	Tenacity in Grams/Den.		Extensibility %		Density (S.G.)	Moisture Regain, at 65% R.H., 68°F.
	Dry	Wet	Dry	Wet		
"Courtelle" (3 den.)..	3·3 - 3·6	2·4 - 2·9	40 - 45%	40 - 45%	1·15	1·3%
Wool, 64s B. Quality	1·0 - 1·7	0·8 - 1·6	25 - 35%	25 - 50%	1·32	16%

High-Bulk Yarns

Many attempts have been made since the introduction of continuous-filament yarns to produce a yarn equal to a spun yarn in softness and handle with better covering properties. Excellent textured yarns have been made from continuous-filament yarns simulating spun yarn and many types in production for some time have sold in large weights.

Textured yarns, however, must not be confused with high-bulk yarns which are made by combining fibres of different shrinkage properties in sliver form, in approximate proportions of 60% low shrinkage fibre, with 40% of high shrinkage fibre. The resultant yarn made from these blends is relaxed in steam, hot air, or dye bath, causing the high shrinkage portion of the blend to contract approximately 20%, which makes the low shrinkage fibre buckle or arc to form loops on the surface of the yarn giving more yarn volume for the same weight.

Machinery

The chief systems for converting tow into staple are:—

(1) Cutting or shearing.
(2) Stretch breaking.
(3) Cutting with carding.

With the last method the customer prefers to cut to staple length at as late a stage as possible and so receives the material in tow form. The card is still used, however, and the "converter" or "stapler" is used in conjunction with it. The worsted industry was the section most desirous of a method of conversion as an alternative to carding. The existing double or single cylinder worsted card gives drastic treatment to the staple fibres and makes it imperative that the sliver should be combed after carding.

Combing, however, is expensive and the need was felt for a converting system that would produce an uncombed top sliver suitable for a variety of uses. In 1937, Courtaulds Ltd. examined the possibility of producing a converter for the worsted industry to eliminate carding and combing. The initial work was carried out in Coventry, at Arrow Mill, Rochdale, and at Westcroft Mill, Bradford, and the machine known then as the Greenfield machine began producing top at Westcroft in 1938. Because there was an excise duty on continuous-filament yarn the prototype machine was transferred in 1939 from Westcroft Mill, to Greenfield Works, North Wales, where viscose tops were produced and sold as "Greenfield top." The following qualities were then available for the worsted and silk industries:—

1·5 den. 4 ins. "Fibro."
1·25 den. 4 ins. strong "Fibro."

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* *A paper given recently to Keighley Textile Society.*

† *Formerly manager, Courtaulds Ltd., Westcroft Mill.*

3 den. 4 ins. "Fibro."
4·5 den. 6 ins. "Fibro."
8 den. 8 ins. "Fibro."

After the war, when the duty on tow was removed, the original converter with ancillary machines was returned to Westcroft Mill, where several units have been working on a commercial basis up to the present time.

Present Position

The converter is now only one of several machines available for converting tow and the chief systems and machines used commercially today are:—

(1) Cutting or shearing—Courtaulds-design, Pacific and Rieter machines.
(2) Stretch breaking—Halle-Seydel with Turbo-Stapler.
(3) Cutting and carding—Mackie's system and the Nordorn I.G.V.S.

Ideal Features of a Tow-to-Top Converter.—A tow-to-top converter must accomplish the following:—

(1) It must be able to cut or break a continuous tow of filaments into predetermined staple lengths of from 2½ - 8 ins. in all deniers and must form the staples into a sliver afterwards.
(2) The parallel formation of the filaments should be retained to as great a degree as possible but with adequate cohesion in the sliver for subsequent processing. The latter requisite is accomplished by the introduction of a mechanical crimp into the sliver.
(3) The sliver should be as free as possible from excessive amounts of dust, short fibre or imperfections due to inefficient presentation of the tow to the converter, or unsatisfactory cutting or breaking by the machine.
(4) The converter must be economical in production and sell at a reasonable price.

Quality Requirements of Tow for Converting.—The quality requirements of tow which I think are essential for all converters referred to in this paper are as follows:—

(1) Filament Freeness.—That is a state in which each separate filament may flow freely during subsequent drafting operations. Tows can contain sticking filaments, i.e. groups of filaments held together which pass to cutting as a unity and still ahdere even after stapling, thus causing a fault. This can be caused by local damp patches in the tow.
(2) Entangled Filaments.—These are sometimes known as cobwebbed filaments and are a cause of short fibre in the sliver as they are not presented to a cutter in parallel form.
(3) Parallel Formation of the Tow.—Besides cobwebbing of the tow, it is essential to see that any twist in the tow is removed before the tow enters the feed rollers to the cutter or break zone. This could be serious where heavy tows are used as it would affect the staple length. If tow cartons are placed on a turn-table, the twist can easily be removed.
(4) Finish.—A suitable anti-static should be applied to the tow by the producer which will allow free filament movement by not being too sticky.

Types of Converters

Cutters or Shearers.—The Greenfield system (marketed by F.N.F. Machinery Manufacturing Co. Ltd., Burton-on-Trent, as the Courtaulds-design tow-to-top converter) has recently been re-designed with a view to offering a more streamlined and compact machine to both combers and spinners. It is capable of converting all types of man-made fibre tows into sliver form and can be fitted with a heat-stretch unit for the production of high-bulk sliver (I prefer the heat-stretch unit to be separate and combined with a suitable crimping device). In the Courtaulds-design process, six 350,000 den. tows are fed making a total input of approximately 2,000,000 den. These tows are then passed under suitable tension beneath a helical cutter which revolves on a steel anvil roller and cuts or shears the continuous tow at an angle of 5 to 15°. This angle is necessary to give the required overlap in the sliver from the cutter roller.

The tows cut to pre-determined staple lengths are then carried on an apron to the pins of the intersector gill and drafted in the normal way. The sliver next passes from the front rollers, through the crimping rollers and into the can coiler. The slivers are given two further passages through intersector gill and delivered in ball or bump top form as desired. Blends of spun-dyed tows can be made behind the machine if the tows are of a suitable size, i.e., not so heavy as to limit the blend percentages obtainable and are usually better blended than by carding. The extra cleaning at the card is avoided and the cost of blending is lower.

During cutting or shearing a certain amount of crushed filament is produced which is drawn out of the sliver by suction from underneath the fallers; crushed filament left in the sliver could form the nucleus of a nep. It is considered that the normal cutting is variable enough in staple length to give maximum regularity of yarn, although a bias motion can be fitted to the machine if desired.

The quality of the converted top in 8 den. 8-in. viscose rayon can be considered equal to the quality of a combed top for most purposes. The quality of all other converted viscose tops in the following deniers is considered suitable for blending with wool by recombing:—

1·25 den. 4-in. viscose
1·5 den. 4-in. viscose
3 den. 4-in. viscose
4·5 den. 6-in. viscose

When converting synthetic fibres, e.g., nylon, polyester and acrylics, converted tops can be produced for certain purposes which do not require combing. The end product, however, is the determining factor for the ultimate method used and it can only be decided by fitness for the purpose intended. With this system no excessive strain is placed on the filaments during the cutting, therefore the physical properties of the filaments are not impaired in any way.

Fig. 1 illustrates a modern British tow-to-top converting unit consisting of the Courtaulds-design converter in conjunction with Prince-Smith and Stells "Speed-o-Gill." The tow tensioning creel gives adequate spread to the tow where use of the larger type of overhead unit is impossible due to space considerations and the crimping box has been designed as a result of considerable experimental work.

Pacific Converter

This Warner and Swasey machine converts continuous-filament tow into sliver using the same type of cutting or shearing rollers as the Courtaulds-design machine, with certain modifications. The continuous tow is very efficiently drawn out of the cartons by an overhead creel to straighten it and remove any twist before it is passed through tensioning rollers to present an even sheet of filaments to the cutting roller.

In the latest Pacific Converter, a heat-stretch unit precedes the cutting or shearing roller which enables a sliver with high bulking potential to be produced if required, at the same time that unstretched material is being produced which by-passes the heat-stretch unit. The stretched and unstretched slivers are brought together in the normal way and passed through the cutting rollers, to be converted into predetermined staple lengths.

Variable staple length is obtained by a mechanism which produces a double variable cut. The mechanism divides the tow into two parts, each portion of tow being in separate guides mounted over each other. If a double variable staple is required, one portion of the tow is made to traverse to the right and the other to traverse to the left of the cutting roller. By this arrangement, one half of the tow is fed into the cutter to follow the angle of the cutter blade, producing long filament staple and the other portion traverses in the opposite direction against the helix angle of the cutter to produce a shorter filament staple. The long and short fibres together give the bias diagram. The amount of variation in staple length can be controlled by varying the speed at which the two guides traverse relative to the cutter roller intake speed.

The cutting roller is the same type of helical cutter as the Courtaulds-design machine except that the spaces between the

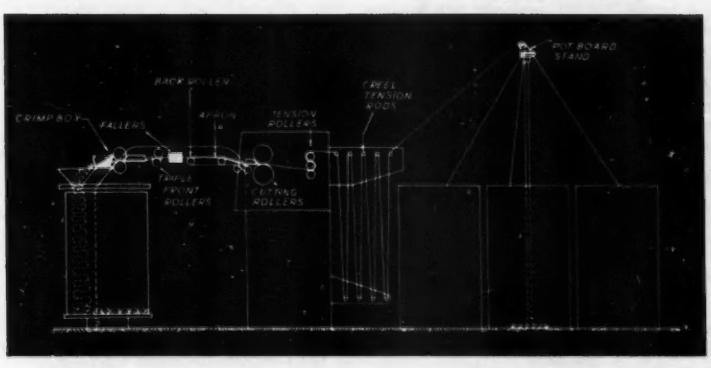

Fig. 1. Section through "Speed-o-Gill" cutting head (Prince-Smith and Stells Ltd.)

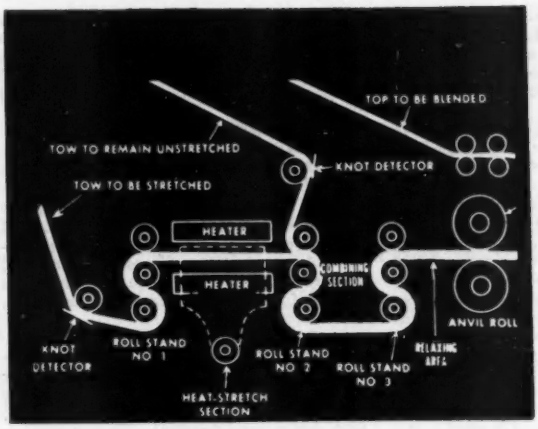

Fig. 2. Schematic drawing of Pacific converter stretch attachment

blades on the roller have a suitable rubber covering which enables the tow to be more efficiently controlled. This gives more accurate shearing and a squarer fibre diagram than that normally obtained by using a roller without the covering, as in the case of the Courtelle-design cutter. On the other hand, the latter machine produces a fibre length with a natural bias and this, incidentally, is considered by some spinners to be the optimum degree of bias for processing synthetic fibres.

After leaving the cutting roller, the tow passes through two pairs of deep fluted rollers—debonding rollers—which impose a slight draft. Their main function is to separate the filaments. The cut tow sheet then passes to a pair of rollers where it is drafted and carried forward on an endless apron and then passes between the first shuffle section rollers. These are a series of scratch-fluted top rollers and smooth bottom ones, with an endless apron running between them, which carries the cut tow to the second drafting rollers, which in turn deliver the drafted sliver into the second shuffling section.

Final separation of fibre takes place here and a pair of drafting rollers deliver the cut filament or sliver on an endless apron. A revolving diagonal-fluted roller on this apron lifts and rolls diagonally the sheet of filament and delivers the sliver through two small rollers into the crimping box. The crimping box drops the sliver into a receptacle which acts as a reservoir in order to keep a constant feed of final sliver into a can coiler. The converted sliver in many cases has three passages of pin drafters and one passage of long draft roving where twist is inserted and is finally spun into yarn on a suitable spinner, in many cases is a high draft type.

Fig. 2 is an illustration of the Pacific Converter and shows the blending in sandwich form of heat-stretched tows which have passed through a pair of infra-red heating plates with unstretched tow prior to converting to staple at the cutter roller, thus forming a high bulk blend sliver. The Pacific Converter also has provision, if desired, for blending in of wool top after cutting.

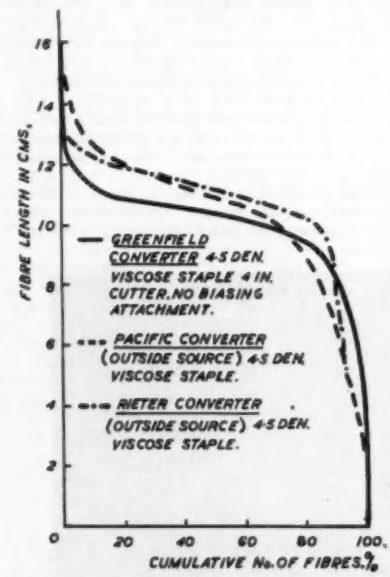
FIBRE LENGTH IN CMS.
GREENFIELD CONVERTER 4·5 DEN. VISCOSE STAPLE 4 IN. CUTTER. NO BIASING ATTACHMENT.
PACIFIC CONVERTER (OUTSIDE SOURCE) 4·5 DEN. VISCOSE STAPLE.
RIETER CONVERTER (OUTSIDE SOURCE) 4·5 DEN. VISCOSE STAPLE.
CUMULATIVE No. OF FIBRES. %

Fig. 3. Fibre length distributions for 4·5 den. matt viscose converted to staple on three machines

Rieter Converter

The D6/2 tow-to-top converter, made by J. J. Rieter and Co. Ltd., Switzerland, was shown for the first time at Basle Fair in 1957. It is interesting to note that this firm has combined the helical cutter with a standard intersector gill box of their own pattern. In the converting operation the tows are fed from an overhead creel where each tow is tensioned individually and then passed through tensioning rollers which ensure that an even tensioned sheet of tow is fed into the cutting or shearing rollers. These cutting rollers have a suitable rubber covering in the same way as the Pacific Converter. The cut tow is then delivered to an endless apron which carries the sheet of filaments forward under a back roller into the fallers of the intersecting gill box. The front rollers deliver the drafted sliver into a pair of small rollers, which in turn deliver the sliver into a stuffing box where it is crimped and delivered into a can coiler. The sliver is then given two finisher operations of gilling to the finished top stage. This machine has many refinements and is well-designed, but in general the operation is carried out on the same lines as the Courtaulds-design machine.

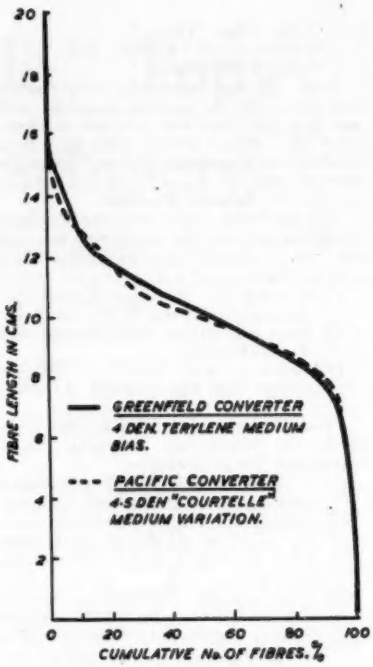
FIBRE LENGTH IN CMS.
GREENFIELD CONVERTER 4 DEN. TERYLENE MEDIUM BIAS.
PACIFIC CONVERTER 4·5 DEN "COURTELLE" MEDIUM VARIATION.
CUMULATIVE No. OF FIBRES. %

Fig. 4. Fibre length distribution diagram for 4 den. "Terylene" and 4·5 den. "Courtelle"

Fig. 3 illustrates the fibre length distributions for 4·5 den. matt viscose converted to staple on three machines:—

(1) Courtaulds-design converter: nominal length 4 ins., mean fibre length 10·0 cms., i.e. 3·9 ins.
(2) Pacific Converter: nominal length 4½ ins., mean fibre length 10·5 cms., i.e. 4·2 ins.
(3) Rieter Converter: nominal length 120 mm., i.e. 4¾ ins., mean fibre length 10·6 cms., i.e. 4·2 ins.

The materials all have a similar shape although of nominally different staple lengths and all show that with viscose rayon staple a bias is obtained without the aid of bias devices, which should be sufficient for normal processing.

Bias Cutting

Figs. 4 and 5 demonstrate the curve of the fibre length distribution diagrams from the Pacific and Courtaulds-design converters and are intended to show the degree of bias obtainable. Fig. 4 illustrates:—

(1) The Courtaulds-design converter on 4 den. "Terylene," mean length 10·3 cms., i.e. 4·0 ins.
(2) The Pacific converter on 4·5 den. "Courtelle," mean length 10·1 cms., i.e. 3·9 ins.

Both machines were set with their respective bias cutting attachments to give medium bias, i.e. more than that given by the so-called "square" cut. It is quite surprising how near alike these two samples are. Fig. 5 illustrates:—

(1) The Courtaulds-design converter on 4 den. "Terylene," mean length 11·3 cms., i.e. 4·5 ins.
(2) The Pacific converter on 4·5 den. "Courtelle," mean length 10·3 cms., i.e. 4·0 ins.

Both machines were set to give a maximum amount of bias and are similar in shape although the percentage of fibres

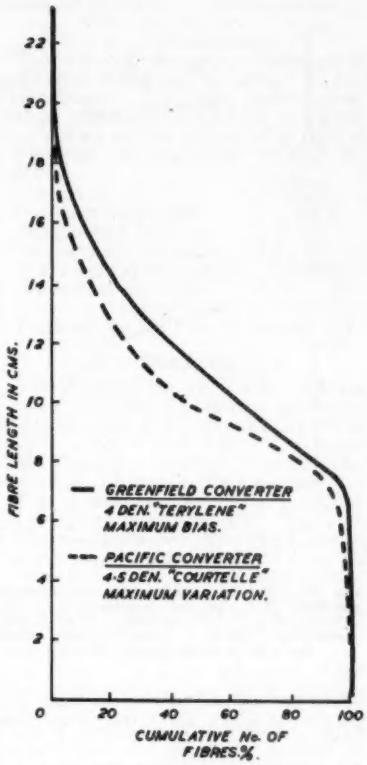

Fig. 5. Courtaulds-design converter on 4 den. "Terylene," mean length 11·3 cms. (4·5 ins.) and Pacific converter on 4·5 den. "Courtelle", mean length 10·3 cms. (4·0 ins.)

at each length is different. In my opinion the amount of bias shown is excessive and is not required to ensure the optimum drafting and blending conditions.

Cutting and Carding

In the flax industry of N. Ireland, two methods are used for processing rayon from continuous tow. The first is the cutter, made by J. Mackie and Sons, and this works in conjunction with the card. Six double continuous tows are fed individually to six stationary cutters which cut each tow and deliver it on to the feed sheet of the flax finisher card where the staple is carded in the normal manner. The sliver produced from the card in 3 and 4·5 den. is fairly free from nep and satisfactory for drawing and spinning on the flax system. The subsequent operations following carding are two or three drawing operations and one roving and spinning. The resultant yarn meets with the requirements of the manufacturers in N. Ireland for many purposes. In the second method the continuous tow is cut by an overhead traversing cutter which cuts the tow on the bias 4 to 8 ins. This is delivered into a wagon and is then carded on the finisher card in the normal way.

The Nordhorn card is a German method for cutting cotton staple lengths on the same principle except that there are four cutters which traverse across the card, cutting each individual tow. The results obtained are quite satisfactory and this is an interesting machine which consists of two operations. After opening and crimping, the tow is wound on to a bobbin and three bobbins are placed behind the roller and clearer card. The three individual slivers from the bobbins are passed over tensioning bars, through two pairs of rubber-covered rollers, and four traversing circular rotary cutters which traverse the width of the 60-in. card, cut the tow into pre-determined staple lengths. It is then delivered on to the feed sheet of the card and carded in the usual way. The staple length can be varied by altering the speed of the four cutters, each cutter carrying its own motor. The cutters revolve only on the cutting plane and on the return traverse they are stopped by a suitable braking device. The slivers which are considered to be satisfactory are processed on a reduced number of drawing operations and spun into a yarn in the usual way.

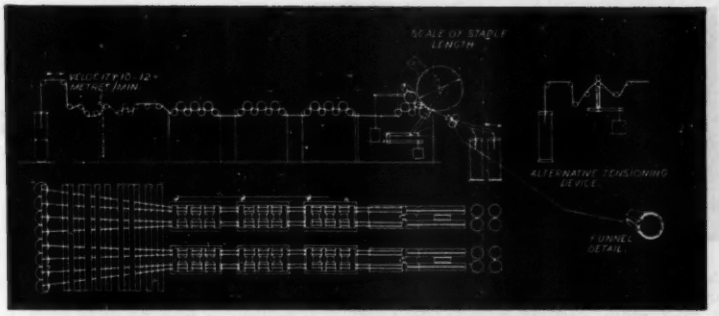

Fig. 6. Zell Wiesentahl combination Halle-Seydel machine. Output 550 to 600 K.G. for 10-hr. shift

Stretch Breaking

Most cotton spinners will agree that for 1·5 and 1·25 den. in up to 2½ ins. staple length, the cotton card is a most efficient and economical process and the resultant sliver is satisfactory for most types of yarn up to 80's cotton counts when using strong "Fibro" rayon staple. In staples 4 ins. and above in fine deniers, the cotton card is not suitable. No roller card has yet been made that will card 1·5 den./fil. material in 4 and 8-in. staples which does not require combing.

This problem of dealing with fine deniers in long staple was first investigated in Germany by the wool combers who were attempting to develop suitable machines for stretch breaking continuous tow in two operations, in deniers suitable for blends with wool. The first operation was carried out on the I.G. Halle machine and the second on the Seydel machine but this was not satisfactory from the wool-combers' point of view and it was therefore discontinued.

Further developments were carried out and a modified machine incorporating features of both the Halle and the Seydel machines was produced, hence the name Halle-Seydel.

I.G. Zell Modified Tow-to-Sliver Machine

The Halle-Seydel machine was employed using fine filament denier tows for stretch breaking, with the object of supplying the Schappe spinners with a suitable sliver which would process on standard Schappe machinery. Although the sliver was unsuitable for the worsted type of drawing due to excess of short fibre, there was no difficulty in adequately controlling the short fibres on these machines and a satisfactory yarn from 100% fine denier-long staple rayon in 80's cotton counts was produced. This system is expensive but it is employed extensively for producing fine counts at the present time.

Eight tows are fed into the machine which has four deliveries, side by side, and breaking is carried out in three stretch breaking zones without the aid of deflectors. In this process the filaments have low extensibility due to stretching and the production per four-head machine is in the region of 100 to 120 lbs./hr. of rayon tow. Fig. 6 illustrates the machine which produces sliver with a fibre diagram of random distribution. The material which has a long maximum fibre length has only a low nep content and the machine following it must be capable of dealing with long and fine fibre.

Turbo-Stapler

The present Turbo-Stapler has been developed from the Perlock process patented by Lohrke in the U.S.A. over 25 years ago and used mainly on viscose staple. Turbo stapling is not considered an efficient method for viscose rayon in coarse denier or fine denier if intended for use in Bradford open drawing, as it has too much short fibre in it for satisfactory processing. With the introduction of acrylics, however, and the demand for high-bulk yarns, the Turbo-Stapler machine which incorporated the heat-stretch zone, was found satisfactory for producing a stretched and unstretched sliver for high-bulk yarns.

Early work on the Turbo-Stapler was carried out with "Orlon" to try and produce what was called a "cashmere" type of yarn for use in knitted outerwear. In the original method of operation of this machine, the tow was heat-stretched to reduce the filament denier before being stretch-broken, producing a high shrinkage sliver which was then relaxed or shrunk by steam. The resultant yarn produced was lacking in fullness because in the so-called "cashmere" process, all the fibres were relaxed and pre-shrunk. In the new process, 60% of the slivers from the stapler go to the steam setter for relaxation by an alternating cycle of steam and vacuum. The slivers are then blended with 40% of non-shrunk (or non-relaxed) fibre, which is still a high shrinkage fibre, at the next operation. One further gilling operation is sufficient to produce the final top ready for the spinner.

After the spun yarns are dyed in yarn or garment form, the high shrinkage 40% shrinks and the pre-shrunk 60%, not being able to shrink any more, bulks up and

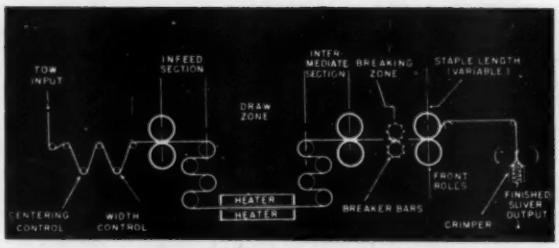

Fig. 7. Schematic drawing of Turbo Stapler

therefore increases the fullness of the yarn or fabric. Shrinkage by steaming the yarn is now often performed as a separate operation from the dye bath, that is, in similar manner to the sliver steam-vacuum cycle.

The present method of operation is explained with the aid of Fig. 7. This shows a drawing of the flow of material through the Turbo-Stapler machine. This machine is a one-zone process using a deflector to convert continuous filament tow into staple. The four areas of the Turbo illustrated are the creel, the hot stretch zone, the breaking zone and the crimping box.

Prior to entering the stretching zone, the tow of 480,000 den. is fixed through centring and width controls to give a width of the order of 5 - 8 ins. The tow then passes between the two heater plates which enable the stretching to take place by plasticising the fibre. Stretching is obtained by applying a draft between the feed and intermediate rollers. The heater plates have a range of up to 500°F. and the most suitable temperature has to be determined, e.g. "Courtelle" would be at a plate temperature of 240°F. and the draft would again be say 1·35 to 1·60 according to the fibre.

The breaking zone illustrated is where the filament is converted to staple fibre by modified stretch breaking; the draft being applied between the intermediate and front rollers. The overall draft can be adjusted between 2·38 and 14·27 as can the breaker bar—front roller draft. To assist the rupturing of the tow a pair of rollers, each fitted with abrasive bars of the Alsimag type, are placed midway between the heavily weighted intermediate and front rollers. The extent to which these bars intersect is adjustable.

The distance from the front rollers to the abrasive bars is also adjustable and this setting influences the maximum staple length produced. Some prefer to use a setting of about 8 - 9 ins. at this point and then break excessive long fibre by passing the sliver through a second machine equipped solely with two pairs of rollers set from 6 or 7 ins. apart. It is claimed that less short fibres are produced by this method. The fibre diagram produced from the Turbo is one of varying length. During stretching the crimp in the tow is removed but can be put back by means of the crimp box.

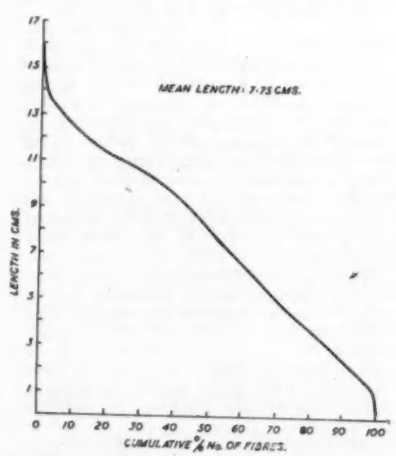

Fig. 8. 100% 3-den. 6-in. Turbo "Courtelle" 5-in. breaker box ratch. (60% fully relaxed sliver, 40% unrelaxed sliver.)

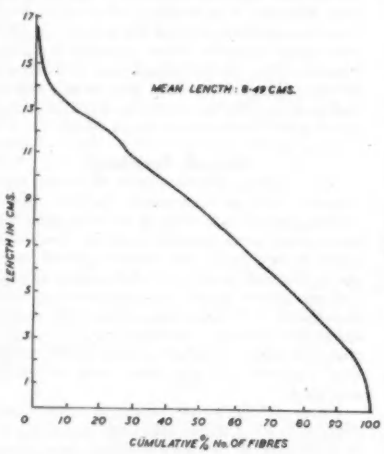

Fig. 9. 100% 3-den. 7-½in. Turbo "Courtelle," 6-in. breaker box ratch. (60% fully relaxed sliver, 40% unrelaxed sliver)

Relaxation

The 60% of the production which is to be relaxed is delivered from the Turbo-Stapler into louvered aluminium cans while the remaining 40% is fed into the normal type of can. The sliver in the aluminium cans is then relaxed by the steam setter. The vacuum phase of the cycle alternates with the steam phase, removing air pockets which tend to form in the cans and thereby ensuring uniform steam penetration. It also serves to deliver the relaxed sliver in a dry state.

High-Bulk Top Production

It is well known that the standard method of producing 100% Turbo-stapled tops which are being made at the present time, consists of relaxing 60% of the unrelaxed sliver, and then blending it at a gill box with 40% of unrelaxed sliver. These tops are only suitable for processing on Continental machinery, and pin-drafters

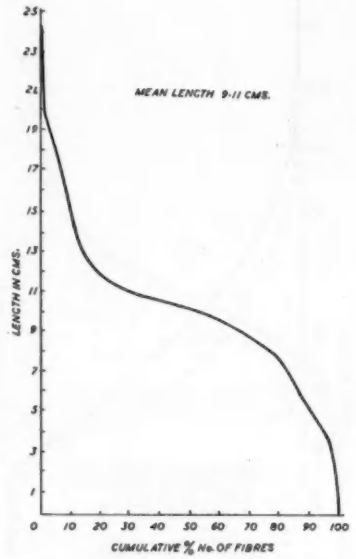

Fig. 10. Blend of converted and combed standard 60% cut and combed 3-den. 4-in. "Courtelle" fully relaxed, 40% Turbo "Courtelle" sliver, 3-den. 7½-in. ratch unrelaxed, mean length 9·11 cms.

which are able to control the high proportion of short fibres that these tops contain.

Bradford System of Open Drawing

Due to the excessive amount of short fibres in the 100% Turbo top it was found that this system of drawing did not give sufficient control of the short fibres to enable a satisfactory yarn to be spun. This problem was investigated at Westcroft Mill in conjunction with commercial consumers of high-bulk tops in order to provide a most suitable top for processing on all types of drawing equipment. Adequate shrinkage and satisfactory yarn cover were both necessary,

This work was completed with the result that three types of high-bulk tops which meet trade requirements have now standardised. These tops are now being sold commercially in large weights and giving satisfaction. Fibre diagrams of these tops are shown as follows:—

Fig. 8. 100% 3 den. "Courtelle" Turbo top, 60% F.R./40% U.R., 6-in. ratch, 5-in. B.B., mean length 7·75 cms. Suitable for Continental drawing.

Fig. 9. 100% 3 den. "Courtelle" Turbo top, 60% F.R./40% U.R., 7½-in. ratch, 6-in. B.B., mean length 8·49 cms. Suitable for pin-drafters.

Fig. 10. Blend of converted and combed standard 4-in. 3-den. "Courtelle" F.R. with "Turbo" Courtelle sliver V.R.
60% F.R. cut and combed = 40% V.R. "Turbo" 7½-in. ratch.
Suitable for Bradford open drawing. Mean length 9·11 cms.

The latter top made for the Bradford system can be processed satisfactorily and produces a commercial yarn which possesses the high-bulk qualities and which compares favourably with 100% Turbo yarns. It is clearer and will spin to higher

counts and is suitable for weaving purposes.

F.R. = Relaxed
U.R. = Un-relaxed

The following settings are given as a guide when processing "Courtelle" on the Turbo-Stapler. We have found these settings satisfactory and have made them our standard for the production of 100% Turbo tops. The essential details are as follows:—

Hot-stretch draft	1·39
Hot plate temperature ..	240°F.
Stretch-break draft	2·73
Breaker bar/front roller draft	2·08
Front roller crimper draft ..	1·069
Breaker bar intermesh ..	3
(Arbitrary scale on machine)	
Ratch setting	5 ins. to 13 ins.

The Steam Setter

This machine (Fig. 11) is used to relax a portion of the stretch broken material from the Turbo-Stapler if a conventional Turbo high-bulk top is to be made. Yarn when made from this or other blends can also be relaxed on the steam setter if required.

The conditions recommended for the steam relaxation of "Courtelle" Turbo are a steam temperature of 240°F. and a vacuum/steam cycle of 4/4/2/8/4 mins. A maximum indicating thermometer should be buried in the centre of the sliver cans, and a careful check made to see that the sliver has been set at the recommended temperature throughout.

In order to keep the shrinkage of the sliver fairly constant, the following points require attention at the Turbo machine.

(1) The in-feed and intermediate rollers should be adequately weighed in order to avoid any slippage of tow in the stretch zone.
(2) Slivers produced under varying stretch conditions in the heat-stretch zone will result in the production of varying shrinkage properties in the un-relaxed sliver.
(3) The temperature in the stretch zone should be as low as possible consistent with satisfactory shrinkage properties. If the temperature gets too low excessive breakage of filaments in the tow will take place when in the heat-stretch zone.
(4) The tow leaving the stretch zone has a tendency to increase the temperature of the surface of the rollers in the intermediate section. There is a cooling fan placed underneath the rollers in this zone in order to prevent the possibility of varying shrinkage, due to varying roller temperature.
(5) Machine speeds should be kept constant as variation in speed can also affect roller temperature and affect shrinkage.
(6) Shrinkage tests should be taken at regular intervals, e.g. every two hours.

Summary

It can be considered that the cutting or shearing method of converting man-made tow into top as used on the Courtaulds-design, Pacific or Rieter machines is suitable for handling standard acrylic fibre in 3 den. and above. These machines produce a sliver superior to any from a worsted or roller and clearer card at the present time. For some uses, e.g. a wide field of hosiery yarns, no combing would be necessary but for critical end uses, e.g. most weaving yarns, 3 or 4½ den. material would have to be combed. When this standard material is to be blended with wool by a recombing operation no previous combing of the acrylic content is necessary.

The machines described can also fulfil a useful purpose by providing the relaxed component for a high-bulk blend with Turbo material. With regard to the Turbo-Stapler its most useful function, as is well known, is in producing a high-bulk top from acrylic fibre for making into knitted outerwear yarns, etc. The product from this machine is not entirely satisfactory if we consider the large amount of normal Bradford open drawing equipment available as the sliver requires good pin control to prevent the development of slubs. A compromise is achieved by blending high shrinkage sliver from the Turbo with fully relaxed standard Courtaulds-design, Pacific or Rieter slivers in the previously mentioned manner.

I have referred to a cutting and carding system which has been found to meet the requirements of the flax industry when carding all types of man-made fibres including acrylics. This system of cutting with carding produces a sliver with less nep than that produced by carding conventional press-packed staple. The modified Halle-Seydel can be considered a satisfactory machine for converting fine deniers (below three) into sliver form in long staple, although there is an excessive amount of short fibre. This requires adequate control necessitating the use of Schappe machinery, which is an expensive process. Finally, I would say that providing a heat-stretched tow becomes available commercially, all the types of converters which I have described in this paper may be used for the production of high-bulk slivers from continuous acrylic tows.

Acknowledgements

The author thanks the directors of Courtaulds Ltd. for permission to publish this paper, and also to acknowledge the help given by the Commercial and Experimental departments.

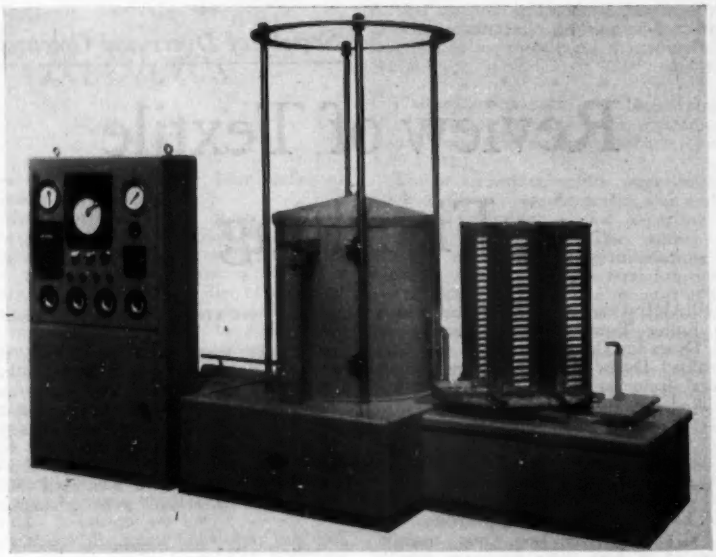

Fig. 11. The V.B. type setting plant (Sanderson and Co. (Textile Engineers) Ltd.)

New Procion Dyes

Procion Brilliant Yellow H3GS is the latest addition to I.C.I. Dyestuffs Division's range of reactive dyes. It is a homogeneous dye of the less reactive Procion "H" type and in pale-to-medium depths of shade produces bright greenish yellows redder in tone than those obtained from Procion Brilliant Yellow H5GS. The new dye is superior to the latter in building-up properties, giving a very strong golden yellow in deep shades, and it will be of value not only in self-shades but also, in conjunction with Procion "H" blues, for producing strong bright greens. Procion Brilliant Yellow H3GS will be mainly of interest in textile printing, in which it may be applied to cellulosic fabrics, chlorinated wool and natural silk fabrics by established methods.

Procion Brilliant Orange 2R is a new homogeneous reactive dye which on cellulosic fibres gives brilliant reddish orange shades much redder than those obtained from the earlier Procion Brilliant Orange G. The new dye has much better fastness to hypochlorite bleaching liquors and is expected to find its principal use in the dyeing of full scarlets and reds in combination with other cold-dyeing Procions. It possesses good batchwise dyeing properties and is very suitable for application by pad(alkali)-batch processes. It has comparatively good stability in sodium carbonate and sodium metasilicate solutions.

* * *

U.S.A. Makes Coarse Wool Imports Duty Free

The House of Representatives has now approved a bill which places all imports of coarse wools on the U.S.A.'s duty free list. Coarse wools are supplied chiefly by New Zealand. At present they are exempted from tariff on a temporary basis, and the exemption is scheduled to expire on June 30, 1960.

America uses these wools for the manufacture of carpets and rugs.

Society of Dyers and Colourists

Review of Textile Finishing

SPEAKING recently to the Manchester Junior Branch of the Society of Dyers and Colourists, Dr. G. Landells (Bradford Dyers' Association) mentioned several ways in which fibres could be modified:—

(1) Molecular re-arrangement.
(2) Chemical modification.
(3) Side-chain substitution.
(4) Cross-linking of main chains.
(5) Internal deposition of polymers.
(6) External deposition of polymers.

The finisher, he said, was mainly interested in how these processes would affect the physical properties of the fibres and fabrics. He was also interested as to how chemical properties were affected particularly as they may affect dyeing.

Discussing substitution reactions inside the fibre, Dr. Landells observed that a number of reactions of this type did modify cellulose, also its dyeing properties, but none were being used as a finishing process *per se*. Examples of such reactions were ethylation, cyanoethylation and acetylation. Cyanoethylation modified dyeing properties of cellulose and acetylation had held out certain promise of producing heat-resistance in cellulose fibres. Certain substitution reactions could be of service to the finisher when limited to the surface of the fibre, when wash resistant surface effects, e.g. water repellency was required. Under the title of surface reactions one could include organic disocyantes when applied from organic solvents.

Dr. Landells showed how this reaction could be made to occur inside the fibre and explained the differences in behaviour of fibres which had reacted at the surface and in which some internal reaction had occurred. He also explained how formaldehyde could be made to cut down imbibition to very low quantities and which could be taken as the model for cross-linking. Urea-formaldehyde was the original condensation resin and was the model for internal resin formation. Newer compounds which were being produced, which were alternatives or urea formaldehyde, e.g. ethylene urea and the triazones. They would appear to belong more to the cross-linked type of finish.

A newer type of finish which had been called the Belfast finish, was then described. Dr. Landells stated that this was of value for shirting and sheetings as an example, in reducing considerably the creases which normally occur in the wet state. This finish was a cross-linking one and it differed from the normal type of urea-formaldehyde finish in that it had wet crease recovery but no dry crease recovery. The basis of the finish was to cross-link the fibres while they were in the swollen state, and he explained how formaldehyde could be employed to produce a somewhat similar finish in this way. Patterns were shown to illustrate the absence of dry crease recovery and the presence of an excellent wet crease recovery in such a finish.

Examples were then shown by the speaker of new finishes, some of which had just gone into commercial production, and others which were not yet commercially available based on molecular rearrangement. That which was available, was being used on ladies' dress fabrics. It was a finish which permitted a printed effect on nylon and "Terylene" to be obtained by dyeing only. The fabric was first resisted then embossed with the nylon dyed with acid dyes. With the "Terylene" disperse dyes only were used. In the case of nylon the dye had affinity only for the embossed parts, due no doubt to more sites being available here for taking-up the dye instead of being covered or blocked by the resist which effectively prevented dye on the unembossed part of the fabric. Therefore, according to the design of the emboss, so there would be the effect of a printed design. Similar effects could now be obtained on cellulose acetate. With "Terylene" it was not possible yet to obtain a pure white background, but this might come later.

Dr. Landrells then described the Scotchgard finish which was the first water and oil repellant finish. He illustrated a good finish on a wool gaberdine rainwear fabric from recent work. Resistant to dry-cleaning, the finish was not durable to washing although there were hopes that a washable finish of this type would be available soon.

Photo-Chemistry of Aromatic Molecules

DISCUSSING the photo-chemistry of aromatic molecules, which he admitted was "a complex business," Professor G. Porter, M.A., Ph.D., F.R.I.C. (Sheffield University), in a recent address to the Manchester Junior Branch of the Society of Dyers and Colourists, said there were two direct ways of approaching the subject:—

(1) Radical stabilisation.
(2) Flash photolysis.

With the first, they had to stop the reaction which took place as a result of radicals colliding with each other. What they did was in effect to surround each radical by a glass case and a simple way was to take isopentane and freeze down in liquid nitrogen. Before they froze down they dissolved something in it like iodine and as a result they obtained a blue glass and if they were shining light on it, then the glass would become colourless. What they had then was a solution of iodine atoms. If they were to raise the temperature slightly, then the glass would go blue again. This method could be used to study free radicals formed in the primary photo-chemical act.

Coming to flash photolysis, Professor Porter explained that this involved the use of a flash of very short duration followed by some rapid spectroscopic recording method which operated before the transients had time to disappear. There were more free radicals, excited states and transient chemical substances than known chemical substances, so that there was a world of chemistry here greater than normal chemistry. It was possible to look at the absorption spectrum immediately after a flash by means of a second flash about 1/1,000 th of a second later. Alternatively, one could take a continuous record at one flash length.

Regarding the triplet state of aromatic chemicals, this came into prominence in the 40's. One did not obtain phosflorescence for any long duration in gases or liquids, but only in rigid media. Rigip media did not tell us a great deal about normal chemistry but the chemical composition and reaction could be studied by means of flash photolysis. One aspect, for example, was how anthraquinone dyes reacted with alcohol. This sort of thing would help in reducing photo-tendering.

Professor Porter observed that the radical was not formed from the triplet. It was important to realise that it was the hydrogen atom which was extracted and not the electron. Recently it had been possible to measure the acidity of the excited state.

Of the photo-chemistry of dyestuffs, Professor Porter observed that they were now beginning to understand the sort of process which occurred. The triplet state was quenched at every collison by some para magnetic substances. Therefore a study of the details and the state involved, could well lead to better performance in dye-stability and prevention of photo-tendering. Work on these lines was being intensified in the U.S.A. and the amount of effort over the past two years was really quite considerable.

T.I. Representatives

Mr. A. W. Bayes and Mr. K. A. Stott have been elected as the Textile Institute's representatives on the Standards Policy Committee for the Cotton Industry for a further period of one year.

Reviews

UNTERSUCHUNGEN ZUR RATIONELLEN DURCHFARBBARKEIT VON BASTFASERGARNEN (Economical Methods for Level Dyeing and Penetration of Bast Fibre Yarns). Dr. I. Lambrinou-Geurten. Westdeutscher Verlag, Köln and Opladen. 1959. Pp. 53 (price DM 14.10).

This investigation arose out of difficulties experienced in getting bast fibre yarns evenly penetrated when dyeing to high standard of fastness. Experiments were made in the laboratory and in dyeworks in dyeing bast fibre yarn in the form of loose hank, cheeses and packed hanks with vat and soluble vat dyes. The vat dyes were applied by the temperature gradient technique and by the pigment method. Dyeing in cheese form gave the best results and it was found that the pigment method had definite advantages over the standard technique. Not only was penetration most even but the yarn was also least affected as determined by tensile strength tests, extensibility and other measurements. Hanks showed the greatest lack of penetration, while packed hanks assumed an intermediate position between cheeses and hanks. Soluble vat dyes undoubtedly gave best results and the conclusion is drawn that it would be worthwhile applying them wherever possible despite increased costs. Auxiliaries did not form a significant part of this investigation but, where they were used, showed an improvement in penetration. B.S.

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KNITTERECHTMACHEN IN REZEPTFORM. R. Gunther. Pp. 242, 105 illustrations, 3 samples. Lapp Verlag; Munchen Gladbach (price 9.85 DM.).

This attractive pocket size book (6¾ by 4¾ ins.) with a glossy cover represents a new style in technical publications. The author is a lecturer in the Textilingenieurschule of Krefeld and has hit upon the happy idea of collecting various recipes for the crease-resisting finish and putting them together as the main part of a small book, at a very reasonable price. The contents are divided into four main parts, first a short account of fibres which are naturally crease-resistant and a description of methods whereby this property may be enhanced, e.g., by various setting processes.

The main part of the book is concerned with the application of various condensation products to the cellulosic fibres and it is inevitable that there should be some repetition, for although there are now about 200 proprietary products on the market, in actual fact these are generally variations on five or six main chemical compounds applied in almost identical conditions. Gunther also separates the crease-resisting recipes from those for the drip-dry finish. Glazing, schreinering, embossing and pleating are discussed in detail and the impression is gained that the author is writing this section with some authority. Many readers will perhaps attach great importance to the fourth and final section which gives a description of various tests for the treated fabrics and does not seem to have been collected together previously.

Minor features of the book include a short account of the methods of impregnation, drying and heating; many of the recipes are accompanied by short notes. There is a useful list of chemical manufacturers and their products but little attempt has been made to characterise these, although many are classified as *R* for reactants, *P* for phenol, *H* for urea products, *M* for melamine compounds and *A* for other types of resinous condensation product. For English readers, acquainted with the subject and a smattering of German, the book is easy to understand for it is singularly free from the tortuous and cumbersome phraseology of an older school. Misprints are few.

It should be stated, however, that this book appears to be concerned with tne practice of resin-finishing in Germany and Switzerland, so that there are no recipes from England or the U.S.A. Similarly, references to the literature rarely mention English work. Nevertheless, this is a book which can be recommended particularly to those concerned with the practice of the crease-resisting finish and testing of the product. It is good value for money and should do well.

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MESSUNG VON VERZUGSKRAEFTEN IN NADELFELDERN VON BASTFASERSTRECKEN) (Measurement of Forces Acting in Drafting Mechanism for Bast Fibres). Westdeutscher Verlag Köln and Opladen. 1959. Pp. 40 (price DM. 11.60).

The purpose of this investigation was to study the influence of variable factors in the lap and the machine setting on the magnitude of the drafting force. A special measuring device, forming part of the drafting mechanism was devised, and measurements were carried out on line and tow. In respect of staple length the drafting force with line was much greater than with tow. Of paramount influence is the weight of the drafted lap; there exists an almost linear relationship between the drafting force and the weight of the delivered lap.

The weight of the lap and the degree of drafting influence the drafting force only if a change in the weight of the delivered lap takes place at the same time. Drafting force as a function of the weighting of the gills is expressed in the form of an exponential function, whereby the influence of the medium weights is greatest. On the other hand the delivery roller weighting is of minor importance.

The drafting force is particularly sensitive to twisting of the lap which changes the position of the fibres and the pressure between them. Such twists lead to peaks in drafting force and to faults in the drafted lap. All this points to a strong relationship between the co-efficient of variations of the drafting force and that of the scattering of the mass in the drafted lap. A correlation with a co-efficient of 0·8 was in fact found in two series of experiments. The main value of the results for the practice is the determination of the limits of the setting values of the machine. In the main they will form the basis for further research in the development of the setting technique in drafting of bast fibre laps. It is an interesting monograph on the subject. B.S.

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WASSERDICHTMACHEN IN REZEPTFORM. R. Gunther. Pp. 147 with appendices. Lapp-Verlag; Munchen-Gladbach (price 5.85 D.M.).

This is an attractive little paper-backed book of the convenient pocket size and it seems to represent a new departure in technical publishing. The author, a lecturer in the Textilingenieurschule of Krefeld, writes in a simple straightforward style. Following a concise account of the various meanings of water-repellency and surface tension, he explains the general plan on which the recipe book is based; this introductory section takes eight pages.

The first part of the book is concerned with "porous water-proofing" or treatments which do not produce a completely impermeable effect; about thirty pages concern various trade preparations based on oils, fats, waxes, salts, etc., followed by another thirty pages dealing with the permanent water-repellent effects.

The second part describes treatments with rubber, synthetic resin coatings, linseed oil, and this also occupies about thirty pages. Testing methods are described in about twenty pages and the book concludes with a short bibliography of the subject, a list of trade preparations and addresses of manufacturers, but there is no index, which makes it a little difficult to find a specific product in the text.

As indicated by the title, the main part of the book is written around a collection of recipes and these are mainly derived from trade pamphlets. The book is none the worse for that, for it is obviously intended for those who are concerned with finishing in the works. Although a certain amount of information is given about the trade products, this is somewhat uneven, and from time to time the reader is left in ignorance of the chemical constitution of the actual material. Nevertheless, this useful little book is excellent value for money.

VAT DYEING OF COTTON PIECE. I.C.I. Ltd., Dyestuffs Division, Blackley, Manchester.

Divided into two main sections, this excellent book is concerned in the first part with the dyeing properties of Caledon dyestuffs and covers dyeing methods, rate of dyeing, levelling properties, assistants, dyestuffs for covering dead cotton, after-treatments, etc. The second part deals with preparation of the cloth, jig dyeing, pigment padding, alkaline leuco padding, acid leuco technique, pad-steam processing, the Standfast process and winch dyeing. Well illustrated and with considerable data, it is a valuable addition to the dyer's library.

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NEW CHEMICALS. Robinson Brothers Ltd., Ryders Green, West Bromwich, have released a data sheet on 1·4-di(carboxymethylthio) butane and 2·2-di(carboxymethylthio) diethyl ether, which are available in experimental quantities. Their suggested use is as metal deactivators or sequestering agents in those cases where ethylene diamine tetra-acetic acid (E.D.T.A.) or its homologues are ineffective, especially in acid or non-aqueous media.

Control of Delamination in Natural Rubber Bonded Non-Woven Fabrics

Migration of latex particles can be prevented by using a gelling agent. Many such agents can be employed and, in general, they may be divided into two classes (a) external and (b) internal gelling agents

By E. G. POLE†

COMMERCIALLY-PRODUCED non-woven fabrics in which the binder is incorporated as an aqueous emulsion delaminate fairly readily irrespective of the nature of the binder employed.

The production of non-woven fabric, whereby a mass of staple fibres is united into a continuous sheet by using the adhesive properties of a bonding agent, is well known. A great deal of information has been made available in recent years concerning the various types of bonding agent suitable for this application,[1] and much attention has been paid to the problem of preparing webs with a highly random fibre distribution in order to obtain a better balance of strength in the finished fabric.

Two distinct methods of obtaining a more random fibre distribution have been developed and have found favour in industry. The first method utilises conventional carding equipment to prepare cross-laid webs, whilst the second involves aerodynamic manipulation of the fibres. The web prepared by the former method is multi-layered, but in the second method the required weight is laid down in one operation. Whichever method is used the finished fabrics delaminate fairly readily and, although delamination of non-woven fabrics is not of major concern for many end uses, if the fabrics are to be coated, pressed or used in conjunction with adhesives, processing difficulties and rapid breakdown in service are more likely if this occurs.

It would appear that delamination occurs because the latex particles are too small to be trapped in the fibrous structure and are carried to the surface by the movement of water during the drying process. This is to some extent verified by the fact that fabrics less prone to delamination can be prepared by using a latex which has been slightly flocculated to increase the average particle size. The preparation of latices to the correct degree of flocculation is, however, difficult to achieve and involves a high degree of risk. In addition there are attendant processing difficulties when pre-flocculated latices are used.

The early work on natural rubber bonded non-woven fabrics carried out by Rubber Technical Developments Ltd. involved the use of a positively charged latex. With such a system, the latex particles are deposited on to the fibres before drying takes place. The location of the particle is thus fixed and the internal bond of the finished fabric is quite good. However, the use of a positively charged latex also presents other difficulties and so an alternative way of immobilising the latex particles before drying is required.

A more obvious method of preventing migration of the latex particles is by the use of a gelling agent. There are a great many such agents which can be used, but in general they may be divided into two classes. The first class, which may be termed *external* gelling agents, includes acids and salts of multivalent metals. The application of these agents would involve the use of a double impregnation system, and the fabric would also need to be washed to improve colour, odour and ageing characteristics. The second class may be termed *internal* gelling agents, and includes zinc ammonium salts and non-ionic polymers such as polyvinyl methyl ether and polypropylene glycols. These agents are added to the latex itself before impregnation is effected, and if the latex is suitably compounded, they are inactive at room temperature. When the temperature is raised, however, the agent becomes active and causes the latex to coagulate. A single impregnation unit only is involved and with certain agents a final leaching of the fabric is of doubtful value.

It is thus probable that internal gelling agents are likely to be more easily applied in practice, and the remainder of this article is devoted to the more common of these gelling agents and to their possible use in the production of natural rubber-bonded fabrics.

Zinc Ammonium Salts

Zinc ammonium salts may be formed *in situ* in ammoniated latex by the addition of zinc oxide and an ammonium salt, and they rapidly de-stabilise the latex when the temperature of the latex is raised. De-stabilisation occurs slowly even at room temperature, and in order to improve room temperature stability, the further addition of a suitable non-ionic stabiliser is necessary. The influence of the non-ionic stabiliser is reduced at elevated temperature and gelation of the latex occurs. The amount of stabiliser incorporated has to be carefully controlled to give the required balance of heat sensitivity at elevated temperature and good stability at room temperature. Unfortunately the degree of heat sensitivity obtained falls off with dilution, and so where impregnation is carried out by bath (Fig. 1) or spray and the rubber content of the latex compound is likely to be as low as 15%, this gelling system maynot prove satisfact ory. It could, however, be used where impregnation is achieved by means of a high rubber content foamed latex, but the fabric will need to be washed.

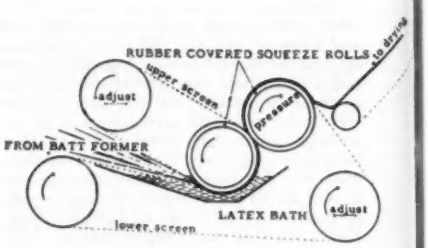


Fig. 1. Bath impregnation for preparation of non-woven fabrics

Polypropylene Glycols[2]

The most interesting feature of this class of agents is that the heat sensitive action is not appreciably affected by the pH of the latex. Compounding is therefore less complicated and the use of these agents may appeal for that reason only. The degree of heat sensitivity obtained again decreases rapidly with dilution, and these agents are only recommended where impregnation is carried out with high rubber content foamed latex.

It should be noted that polypropylene glycols migrate to the rubber surface after vulcanisation and may impart a greasy handle to the finished fabric. A cold water washing process is advisable to remove the agent and prevent this from happening.

Polyvinyl Methyl Ether[3]

This agent is soluble in cold water and dilute solutions are added to latex without difficulty, but at elevated temperatures and reduced pH values the agent is precipitated and causes the latex to gel. An appreciable degree of heat sensitivity is obtained at pH 7 - 8, but to retain good stability at room temperature the addition of a non-ionic stabiliser is again necessary. The necessity for washing using this agent has not been established and, in addition, highly heat-sensitive compounds can be prepared at comparatively low dry rubber contents. For these reasons it is suggested that natural rubber latex compounds for non-woven fabrics may be based on this system if delamination is a problem.

• *With acknowledgements to "Rubber Developments," Vol. 12, No. 3.*

† *Rubber Technical Developments Ltd.*

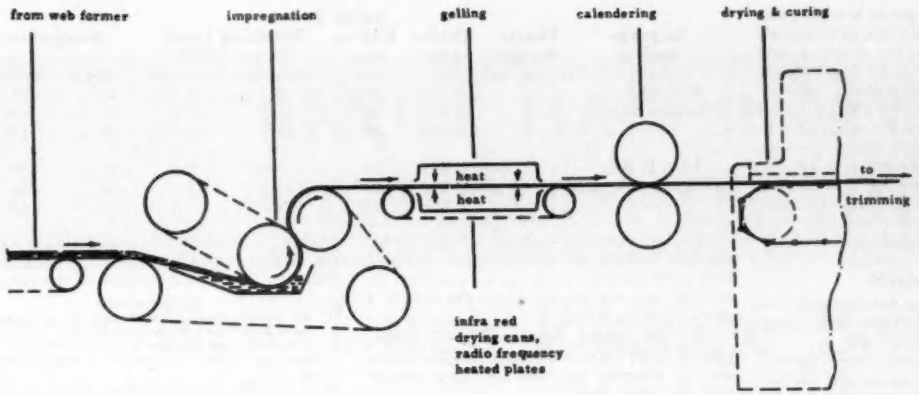


Fig. 2. The fibre web is passed through the impregnator containing heat-sensitive latex and then through the heated region to promote gelation. It is then calendered and finally dried and cured in the oven

Table 1

		1	2	3
		(parts by dry weight)		
Ammoniated centrifuged latex	**60% dry rubber content**	**100·0**	**100·0**	**100·0**
Non-ionic stabiliser (Vulcastab LW)	**20% solution**	**0·5**	**0·5**	**0·5**
Sulphur	**50% dispersion**	**2·0**	**2·0**	**2·0**
Zinc oxide	**50% dispersion**	**5·0**	**5·0**	**5·0**
Accelerator Z.D.C.	**50% dispersion**	**1·5**	**1·5**	**1·5**
Accelerator zinc M.B.T.	**50% dispersion**	**0·75**	**0·75**	**0·75**
Anti-oxidant 425	**25% dispersion**	**1·0**	**1·0**	**1·0**
Soft or distilled water	—	**456·0**	**294·0**	**127·0**
Formaldehyde	**40% solution**	**Sufficient to reduce to pH 9·0**		
Polyvinyl methyl ether	**10% solution**	**3·0**	**2·0**	**1·0**
Percentage dry rubber content		**15·0**	**20·0**	**30·0**
Coagulation temperature		**approx. 32°C.**		
Minimum shelf life at 20°C.		**1 week**		

The compounds listed in Table 1 have been used for the pilot plant production of non-wovens using a bath impregnation system and are suggested as suitable starting points for commercial evaluation. The choice of compound will be determined by such individual requirements as the permissible liquor ratios and the rubber content required in the finished fabric.

The ingredients are added in the order indicated, but in order to minimise local coagulation, the formaldehyde should be admixed with the soft or distilled water before addition to the latex. The temperature of the partially compounded latex should be checked to ensure that it is below the anticipated coagulation temperature before the heat-sensitive agent is incorporated.

The coagulation temperature of latices containing polyvinyl-methyl ether may be controlled by adjusting the stabiliser content or the pH of the compounded latex. An increase in the amount of added stabiliser raises the coagulation temperature and consequently improves the storage life of the compounds. A reduction in pH decreases the coagulation temperature and so reduces the storage life of the compound.

It is interesting to note that increasing the amount of polyvinyl methyl ether above a certain optimum concentration has little effect on the coagulation temperature, but when less than the optimum is incorporated the gel strength of the resulting coagulum is reduced. Gel strength is important, for if the latex is merely flocculated and not firmly gelled upon heating, some migration may still take place. The gel strength of the compounds listed above may be improved by a maturation period of up to one day before use.

It will be appreciated that non-woven fabrics can be successfully prepared only if the web is thoroughly wetted throughout its thickness, and normally highly active wetting agents are incorporated in the latex compound to achieve this. It is unfortunate that the addition of such agents to the finely balanced systems detailed above raises the temperature of gelation, and that large amounts inhibit gelation altogether. Because of this, these compounds cannot be used satisfactorily to prepare fabrics from those fibres which are notoriously difficult to wet, eg. "Terylene" and cotton, and such fibres can best be processed in blends with more easily wetted fibres. No matter what the fibre, to aid wetting, it is suggested that heat-sensitive latices be processed at somewhat higher liquor ratios and lower rubber contents than the more conventional latex compounds.

Gelling Conditions

It should be borne in mind that migration is not necessarily prevented merely by substituting a heat-sensitive compound for a more conventional latex compound. Migration of the latex particle may still take place if appreciable evaporation occurs before the latex is gelled, so particular attention has to be paid to the gelling conditions.

To prevent migration completely, the temperature of the impregnated web should be raised to the coagulation temperature of the latex compound by a method which will avoid excessive evaporation from the surface of the web. Gelation has been achieved on pilot plant scale, using infra-red lamps, steam-heated drying cans and di-electric radio frequency heating, (Fig. 2) and it has been possible to adjust conditions with each type of heating so as to prevent migration taking place. The precise gelling conditions and the method of heating employed will depend, among other things, on production speeds and weights, and the optimum conditions for a particular fabric are best determined by stepwise adjustment on the plant.

It has been noticed that when the temperature of the saturated web is raised rapidly by the application of fierce heat there is some danger of "blowing" due to

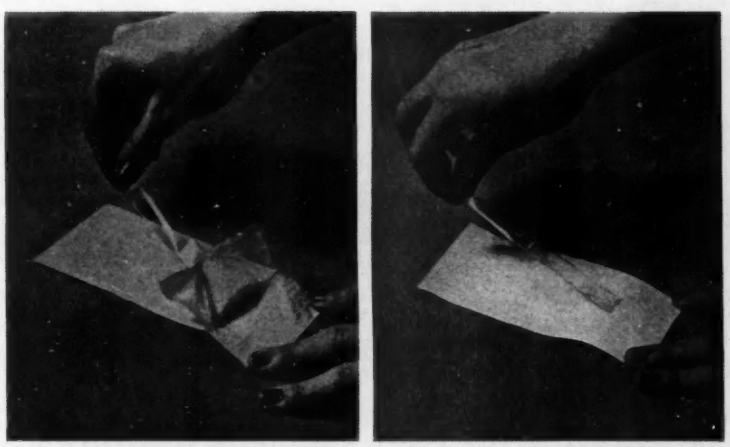


Fig. 3. Removal of adhesive tape from the surface of a fabric prepared with (left) a standard latex compound, illustrating the poor internal bond, and (right) a heat-sensitive, latex compound, illustrating the improved internal bond

the formation of steam pockets within the fabric. This tendency is more pronounced during the production of medium and heavy-weight fabrics and the effects resemble those of migration. Heavy calendering of the wet fabric after gelation has been brought about considerably reduces the effect of any steam pockets which may have been formed, and has the added advantage of removing or bringing to the surface much of the residual moisture, thus reducing the possibility of "blowing" during drying and vulcanisation.

Factory Control

When latices of the type described in this article are used under factory conditions, certain precautions are necessary.

Firstly, the latices require more careful compounding than those in current use for the production of non-woven fabrics. In particular, as has been stressed earlier, the pH and the amount of stabiliser have to be carefully controlled to ensure that the compound is sensitive to heat at the required temperature but still remains stable at room temperature. To ensure uniformity of processing, it is suggested that the coagulation temperature of each batch of latex compound be checked before use.

Secondly, factory floor temperatures are more critical, for the latex temperature should not be allowed to approach the predetermined coagulation temperature. Temperature control of the latex is fairly simple where impregnation is achieved by means of spray or with foam, for the bulk storage tanks may be well divorced from the impregnator and may also be water cooled. Where a bath impregnation system is employed, temperature control may be more difficult to ensure. It is possible to water cool the impregnation bath, but it is perhaps simpler to reduce the bath size to a minimum and to replenish it more frequently with cooled latex. The latex may then be used up before its temperature approaches a dangerous level.

Storage of Heat-Sensitive Latices

Good storage stability of heat-sensitive latices can only be guaranteed if the latices are stored at temperatures well below those at which coagulation takes place. The pH of the latices may, however, be raised for storage and then reduced once more before use. Higher storage temperatures can then be tolerated. It is recommended that compounds be gently agitated at frequent intervals during storage to prevent the settling of compounding ingredients.

Determination of Coagulation Temperature

Approximately 10 c.c. of sensitised latex is poured into a test tube which is supported in a beaker of cold water. The temperature of the water is then gradually raised by means of hot plate or water bath and the latex is stirred intermittently with a thermometer. The temperature at which coagulation of the latex takes place may be fairly accurately observed.

Summarised Advantages

(1) The internal bond is greatly improved. Fabrics can thus be coated, pressed or used in conjunction with adhesives with greater confidence.

(2) There is an overall improvement in strength as can be seen in Table 2 which compares the properties of identical fabrics prepared using heat-sensitive and standard compounds.

Table 2

Impregnating bath	Fabric weight oz./sq. yd.	Thickness ins.	Rubber content	Breaking Load lb./in. width		Elongation	
				Length	Breadth	Length	Breadth
15% D.R.C. Standard latex	2	0·021	30%	4·3	8·8	46%	35%
	4	0·027	40%	11·0	20·8	46%	38%
	7	0·040	40%	19·1	30·2	43%	32%
15% D.R.C. Sensitised latex	2	0·012	30%	5·8	9·5	49%	39%
	4	0·017	40%	13·9	24·5	63%	40%
	7	0·026	40%	20·3	33·8	68%	43%

(3) The concentration of rubber binder on the surface of the fabric is reduced and consequently there is a reduction in surface friction which gives the fabric a more pleasing handle.

(4) The process facilitates the production of high rubber content fabrics which are of interest for certain applications (e.g. the shoe industry).

(5) The wet calendering technique enables water to be squeezed out and the ultimate drying time is reduced. In addition the resulting fabrics are more dense and the handle is again enhanced.

Against these advantages must be balanced the much stricter control required during compounding and throughout the processing. The webs for the fabrics shown in Table 2 were prepared from 3-den. rayon of 2-in. staple, using a single carding engine. The fibre distribution is therefore not random and physicals are quoted along both the length and breadth of the fabrics.

References

(1) An article dealing with the use of natural rubber latex as the binder in the production of non-woven fabrics was published in the autumn issue of "Rubber Developments" in 1955.

(2) A suitable poly-propylene glycol is Polyglycol HS.35/40. The use of Polyglycol HS.35/40 as a gelling agent for latex compounds is covered by patent. Permission to use the process can be obtained from the patent owners, Oxirane Ltd., a member of the Shell Chemical Group, of Marlborough House, 15 - 17 Great Marlborough Street, London, W.1, who also supply the Polyglycol.

(3) Polyvinyl methyl ether may be obtained from Fine Dyestuffs and Chemicals Ltd., Calder Street, Manchester 2, as a 50% aqueous solution, or from Lawfer and Co. Ltd., 27 Regent Street, London, S.W.1, as Lutonal M.40, a 70% solution in Solvenon M.

Control of Static in Warp Knitting

DESIGNED to eliminate static charges in yarn and fabric encountered in warp knitting, the "Lance" static control unit marketed by Coates Smith Ltd., Cawley House, Canal Street, Nottingham, is based on the principle that it is more effective to remove static in stages. In warping, for example, static is generated at the yarn contact points in the creel, and at the reeds and stop mechanisms on the warping headstock; "Lance" electrode heads are therefore normally positioned by the back reed, after the stop mechanism, and finally, as close as possible to the beam.

The low price factor, and the excellent rigidity of construction have also enabled static control to be extended to cover the beaming process in mill warping, where coupled units can be supplied to give full width control, without gaps, over the widest mills. The widening of the "Lance" unit's range of application and its effectiveness in any particular application is made possible by its design and construction. Since it is run from a.c. supplies and, therefore, requires only a single row of points for each electrode head, it is an extremely compact instrument; in fact the shield surrounding the electrode bar and points is only 1¼ ins. square in cross-section.

On the "Lance" unit, the single row of ionising points is fed with high voltage a.c. so that ions of both polarities are produced, and the stainless steel cover allows the points to be positioned within effective distance of the generated static charges.

Ionisation at the points causes the air in the immediate neighbourhood to expand and rise, carrying the ions up into contact with the static charges. This is further accelerated by the design of the electrode head; a slot is provided in the shield on the underside, i.e., below the ionising points, which creates a chimney effect, causing air to rush in to fill the gap left by the rising air, and thus pushing the ionised air into the yarn or fabric sheet. This point is of particular importance in high speed warping, where the slipstream engendered by the warp sheet could easily carry away the ions before their neutralising work was done, unless forced upwards in this way. The chimney effect is, in practice, quite strong, and when the "Lance" unit is operating, the air current can easily be detected if the hand is held above the warp sheet. The up-draught generated by the "Lance" unit also prevents the accumulation of dirt.

The compactness of the heads ensures positioning to a maximum advantage; only two simple brackets are required to fix each electrode head to a reed, stop mechanism, or warp inspector. For these reasons also, it is possible to supply much longer electrode heads to give complete cover for wide warps and fabrics even up to full width mill warping. The power unit, which can feed three electrode bars, is enclosed in a strong steel case, and provides a high tension supply of 6 kV. There is a conduct entry for mains supply, and a terminal strip for mains connections. A pilot lamp indicates when the unit is live. Three separate current limiter circuits are mounted on polished Perspex insulation to avoid tracking, each limiter feeding a special high tension outlet socket for individual feeds to the heads.

TEXTILE MACHINERY and MILL EQUIPMENT NEWS

New Large Package Bottle Bobbin Winder

Constructional features of a new machine which will produce (a) large packages easily penetrated for dyeing purposes or (b) solidly built ones for long running in winding or warping operations

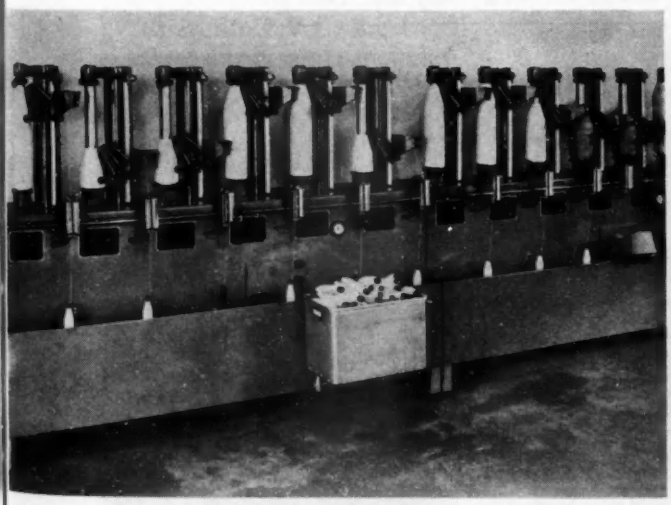
SHOWN at a recent press conference in Macclesfield, a technicolour film emphasised most of the important innovations incorporated in the new F.M. "Hacoba" bottle bobbin winder, introtroduced by Plutte Koecke and Co., Wuppertal, Barmen, Germany. This machine produces two types of large size package (*a*) an easily penetrated type to facilitate dyeing or (*b*) a solidly-built package for warping or winding purposes. The first type of package is extremely open-wound with overall dimensions of 22 × 5·2 ins. Winding construction closely resembles that in an ordinary cross-wound cheese, but because of the cop-type build the length of yarn from nose to shoulder, i.e., internal to external diameter, measures only 14 ins. This short length is a considerable reduction on the length usually employed when building traditional type cheeses, and this is said to give optimum penetration with colour evenness. Other advantages claimed for the F.M. 3-lb. dyeing package include an increase of 30% to 50% in dyeing plant capacity due to the long compact build of the bobbin, and an approximate saving of 16% in dyestuffs and chemicals due to the lower liquid ratio. After doffing, bobbins for dyeing are placed one above the other on perforated dyeing tubes with paper and cloth caps between; the bobbins are each held at the bottom end by a perforated metal cone.

Excellent as a supply package for automatic winding or for use with the Glatex warping creel Type G2 F.M., the F.M. warpers bobbin measures 18·2 × 6·2 ins. ins. The bobbin is used in conjunction with a specially designed spring-loaded supply unit designed to ensure that no variation occurs in the distance between the inlet guide eye and the run-off point on the bobbin. This results in a remarkably flat balloon. In operation the spring is compressed and locked beneath the plastic cone at the base of the package. As the bobbin diminishes in unwinding, the cone is progressively pressed towards the run-off button at the end of the supply unit centre-rod, thus assisting constant yarn tension.

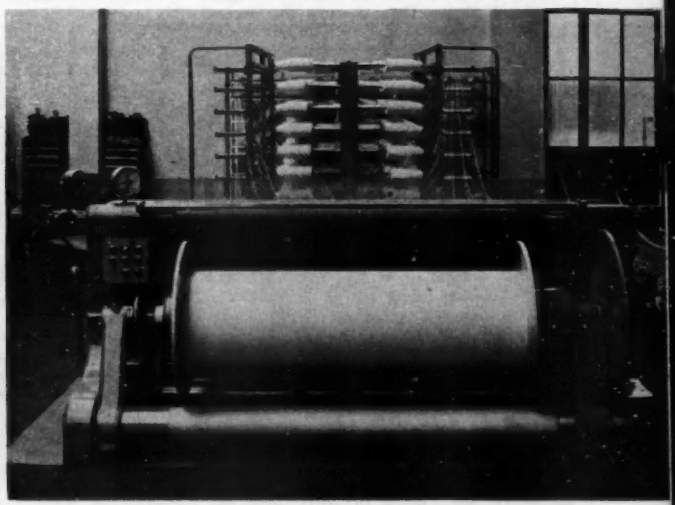
Mechanical Features

Package construction is achieved by a free-running grooved plastic cone, frictionally driven by the package chase, and contact pressure against the package is determined by an inter-changeable counterweight. The cone moves vertically along a steel shaft as building progresses, and the unit as a whole is easily and rapidly manipulated by a ball-handle and shaft.

Designed for easy maintenance and operation, one machine of six winding units



View from the front of the compactly-built "F.M. Hacoba"



Packages from the F.M. in place in the Glatex warping creel

is driven by a 3 ph. a.c. motor with variable pulleys. The winding speed—infinitely variable between 1,300 - 4,000 ft./min.—is controlled through the medium of an easily accessible handle. Individual units have push-button operated electro-magnetic clutches which engage and disengage the bobbins. All six individual units may be operated as one machine from a control panel situated on the front of the frame.

A finely adjustable double disc tension unit is installed. Working on a self-threading principle, the unit incorporates an automatic stop-motion and is equipped with balloon tension compensation device and yarn clearer. Other noteworthy features of the F.M. bottle bobbin winder include a built-in tachometer for immediate indication of yarn speed during winding, an individually driven conveyor belt to remove emptied supply packages, and a light metal box, easily moved along the front of the machine, to facilitate supply package replenishment. The pin unit for supply packages is suitably adapted to accommodate various types of package.

E.G.K. Textiles, 22 Ivy Road, Macclesfield, are the U.K. agents for the F.M. winder.

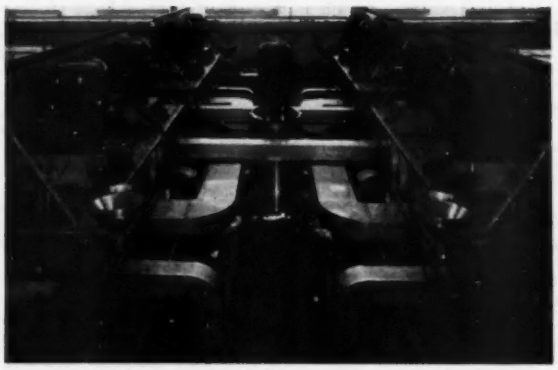


Fig. 1. A view of the interconnecting pipework and the central mixing unit

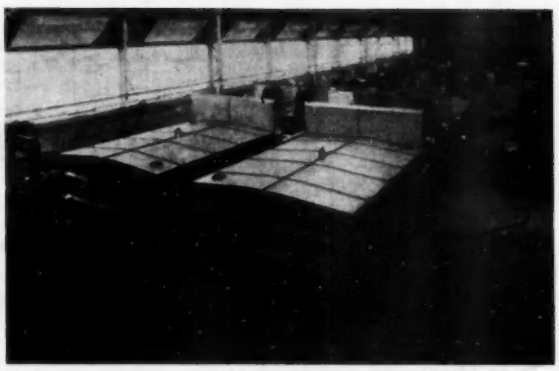


Fig. 2. The huge machine erected in the works' fitting bay

Large Carpet Yarn Hank Dyeing Machine for U.S.A.

MANUFACTURE has recently been completed by Longclose Engineering Co. Ltd., Leeds, of a stainless steel carpet yarn hank dyeing machine having a capacity of 9,000 lbs. for export to the U.S.A. This is only the second machine of its size and type in the world. The first machine, also manufactured by Longclose, was installed in Yorkshire and has operated without trouble since it was commissioned early in 1957. This later machine consists of four units, each accommodating 2,250 lbs., coupled together by means of large section ductwork and a central liquor mixing unit. The overall size of the machine, excluding loading and unloading horses, is 39 ft. × 22 ft. 6 ins. and approximately 21 tons of stainless steel were used in the manufacture. A total of 46 h.p. from the nine motors incorporated in its construction ensure quick and even circulation of the 12,500 galls. of liquor.

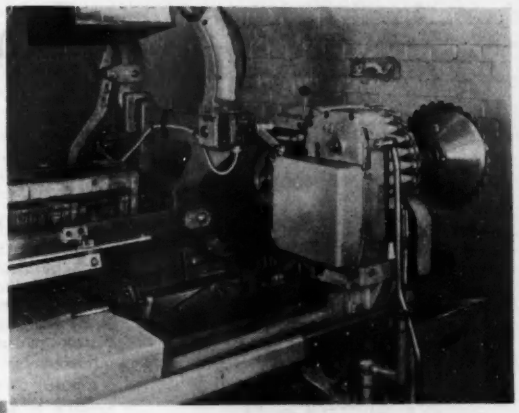
The two photographs shown here were taken in the works whilst the machine was undergoing final tests prior to despatch. Fig. 1 shows the interconnecting pipework and central mixing unit with the nine motors under test. The funnels seen at the rear of each unit incorporate stainless steel sieves to ensure filtration of all dyestuffs, assistants, etc., prior to entry into the machine. These are used in conjunction with liquor reserve tanks which are also being supplied. The reserve tanks are fitted with steam coils to allow dye liquors to be heated prior to entry into the machine, whilst the machine is in operation if required, thereby reducing the overall cycle time and amount of steam required. Fig. 2 shows the machine erected in a section of the fitting bay in Longclose Engineering Co's., Crescent Works, Dewsbury Road, Leeds 11.

Features in New Truck

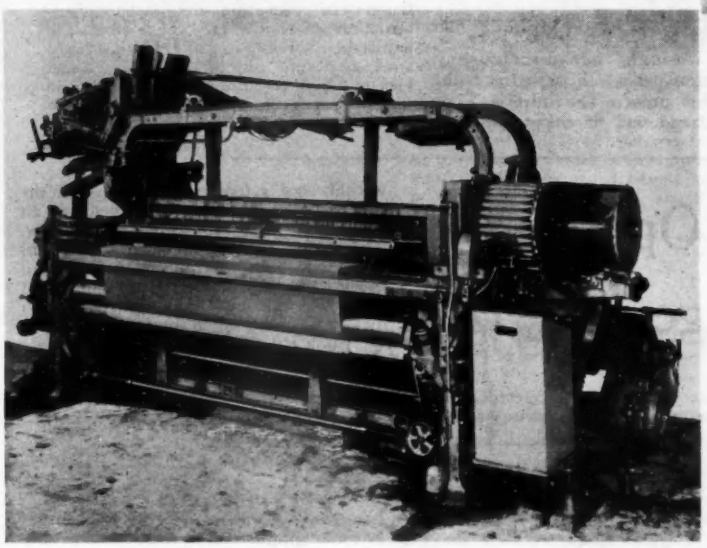
A NOVEL development introduced by G. Hunter (London) Ltd., Gumley Road, Grays, Essex, to facilitate selection of orders in stores, is a spring-loaded stores ladder fitted to a hand pallet truck. The truck itself has several important features including a special design hydraulic unit which virtually eliminates oil leakages and maintenance. The pump ram works without a washer obviating maintenance. There is an interchangeable pump cylinder inside the oil reservoir, thus obviating leakage. High precision ball and tapered roller bearings are used throughout, and fork rollers are available in steel, rubber, nylon, or aluminium. Over 7,000 of these trucks are reported to have been exported to the U.S.A. during the last twelve months.

Rotary Battery on Hattersley Loom

A FURTHER landmark in the development of George Hattersley's "standard model" loom, of which over 6,000 have been built, is the fitting of the four-colour rotary battery (Type TMB4) made by George Fischer Ltd., Schaffhausen, Switzerland. One of the features of this battery is that it will change any colour out of a group of four pirns in any sequence, and will not move forward to the next group until any one colour in the current group repeats.



Close-up of Type TMB4 four-colour rotary battery pirn changer



The Hattersley "Standard" model loom fitted with the George Fischer Type TMB4 four-colour pirn changer

Being mechanical in operation—apart from electrical indication from the feeler—the mechanism is readily understood by the tuner. There are only two connections to the loom mechanism. These are the vertical rods seen at the front of the battery, the longer bringing the colour indication from the rising box, and the shorter being the actuating rod driven by a cam immediately behind the battery.

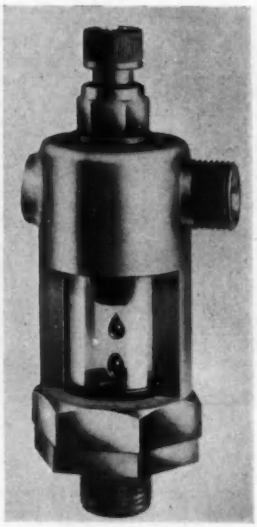
The pirn being positively held at each end until the moment of transfer, reduces the chance of mis-change, whilst particular care is taken in the design to prevent "lashing-in." This battery can be fitted to the recently announced low-built standard model, as well as existing high-built models. The first four of these looms were recently built for a Yorkshire firm of fancy woollen manufacturers, where these photographs were taken. On these 90-in. reedspace models the battery capacity is 28 ($9\frac{7}{8}$ ins. $\times 1\frac{11}{16}$ ins.) pirns and the running speed 110 p.p.m.

Stelvetite P.V.C. Steel

STELVETITE, a plastic-coated sheet steel produced by John Summers and Sons Ltd., Shotton, Chester, is used on all working surfaces of two new selective distributing conveyors recently installed by Transamatic Ltd. at Corset Silhouette Ltd., Harlescot Works, Shrewsbury. Designed by Mr. G. Bowyer (managing director Transamatic, in association with Mr. R. E. Harrison, Corset Silhouette), these conveyors are claimed to represent the most comprehensive and flexible means of work distribution yet devised. To quote Mr. Harrison: "Work in progress has been cut by 60%, supervision cut by 50% and productivity increased by 20%."

Stelvetite was chosen, it is stated, not only for its durability and ease of cleaning, but because—requiring no finishing—it was the most economical means of providing the high quality non-scratch surface demanded by Corset Silhouette Ltd. Styled in green with red trays, the conveyors blend well with the contemporary decor of the Harlescot Works. Transamatic Ltd. are already working on its adaptation to the needs of other industries.

All working surfaces of the two conveyors shown here at the Harlescot works of Corset Silhouette Ltd. are made from a plastic coated sheet steel produced by John Summers and Sons Ltd., Chester



Compact Adjustable Oil Feed Indicator

A SMALL, compact oil feed indicator, 4 ins. high × 1½ ins. dia., which can be fitted into confined spaces and gives a clear indication of the oil flow has been designed and manufactured by Suba Hydraulics Ltd., 86 Lind Road, Sutton, Surrey. The oil feed is readily adjusted by a fine thread control from 3 g.p.m. to complete cut-off while the system is still running and will handle pressures up to 125 lbs. p.s.i. Flow is observed through non-discolouring "Perspex" windows which, sealed at both ends, are dirt proof. The inlet is ⅜ in. B.S.P. male and will fit either standard pipe or flexible hose connections. Outlet is ⅜ in. B.S.P.T. male.

The flow adjustment is so designed that it cannot be accidentally altered or tampered with by unauthorised persons-an Allen key being necessary to carry out any alterations. Having a hexagon base, rigid installation can be made by means of a standard open-ended spanner without danger of distorting the body. Construction of body is bronze and the adjustable screw is made of hardened steel, cadmium plated. The Simmonds' lock-nut is also cadmium plated and the unit finished either dull nickel or black wrinkle.

Portable Mains Operated Beta Gauge

A SMALL portable mains-operated unit has now been introduced into the range of nucleonic thickness gauges manufactured by Baldwin Industrial Controls, Dartford. It has been designed to meet the requirements of those sections of industry where the expense and refinements of the standard beta gauge are not justified. The gauge is calibrated in arbitrary units proportional to weight per unit area and the user can easily co-relate a factor for his own particular product. For simplicity, the gauge embodies only one radioactive source and detector. The output from the detector is compared with a calibrated reference potential and the difference in signal is amplified by an extremely stable low gain d.c. amplifier. The output signal is sufficiently powerful to operate both the built in moving coil meter and, if required, an additional external milliamp recorder. Various measuring head mountings are available according to the application or trade requirements, and alternative radioactive sources are offered depending on the range and thickness or weight per unit area of material to be measured.

Baldwin portable mains-operated beta gauge

New Totally Enclosed Fan-cooled Motor

A NEW range of totally-enclosed fan-cooled motors complying with B.S. draft specification A(ELE) 1629 which are dimensionally interchangeable with British Standard ventilated motors to B.S. 2960 are announced by Higgs Motors Ltd., Witton, Birmingham. These machines comply with B.S. 2613 for Class E insulation and give a similar horsepower output. The motors are smaller in size and lighter in weight than the corresponding totally-enclosed fan-cooled motor to B.S. 2083 and lower in price.

The foot-mounted range has been developed up to 7½ h.p. at 1,500 r.p.m., but at an early date it is anticipated that machines will be available up to 40 h.p. Other derivatives such as flanged; foot and flanged or totally-enclosed non-ventilated type will follow.

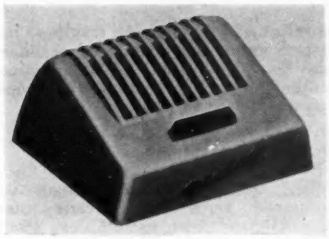
With the exception of the smallest frame the stator housing is ribbed on the outside. This increases the surface area which rapidly dissipates heat from the motor. This construction also gives considerable strength to the shell design. Machines of this type are suitable for use in dirty or fluffy atmospheres. A further range will shortly be available to C.E.M.A./N.E.M.A. North American dimensions based on these frame sizes.

Trade Catalogue

MAN MUST COUNT. A neat, loose-leaf type of catalogue is available from Trumeter Co. Ltd., Milltown Street, Radcliffe. Fully illustrated, it gives concise information on the company's well-known range of counters including tally types, rev. counters, junior and senior counters, measuring counters (cloth, pick, etc., models), electro-magnetic models and special application units. Specifications are included in all cases.

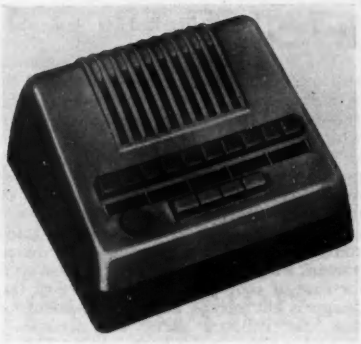
Intercom. Equipment

New de luxe units are the latest addition to the range of high quality Dialog instant intercom equipment announced by Cass Electronics Ltd., Guildford Street, Chertsey, Surrey. At the push of a button instant communication is achieved. The major unit will allow up to nine sub-stations to be connected to it. This facilitates two-way conversation between the master unit and each of the sub-stations. Each sub-station can call the master and the master can call each sub-station individually. There is complete secrecy between circuits. A volume control is located at the master station so that the voice level can be adjusted to suit local conditions. In addition to the talk/listen key at the master, there is a dictation button which will allow the unit to be switched on permanently and leave the operator's hands free whilst he is speaking to a sub-station. There is also an engaged button so that the person at the master can switch off the unit if he does not wish to be disturbed.



Dialog de luxe sub-station

The new DLNr10 de luxe enables a network of up to ten intercommunicating master stations to be connected in one system. In this layout each master station may call any other master station. Each master unit has a dictation, call, and privacy button. There is also a volume control and engaged indicator. The ordinary sub-station, giving only two-way conversation to one master unit, may also be used in this system, the limiting factor being that each master unit can speak to up to nine other stations which can be masters or sub-stations. A network of up to twenty-five stations, comprising master and sub-stations can thus be connected.



Dialog major de luxe master unit

Grinding Joint Faces of Die Sets and Press Tools

A LONG-FELT need in industries associated with the production and use of dies and tools, is equipment for the rapid precision machining of flat joint faces and particularly those fitted with locating dowels, to permit complete grinding at one setting. Lumsden Machine Co. Ltd., Gateshead, for whom Alfred Herbert Ltd., Coventry, act as world-wide agents, have made extensive research into this and have added to their wide range of surface grinders, an entirely new machine, the No. 230X. The machine is of the vertical spindle type. The rotary table is mounted on a carriage which is reciprocated under the wheel by means of a hydraulic cylinder, giving infinitely variable speeds from 5 to 30 ft./min. Reversal of the table is smooth and free from shock, which enables fine finishes to be obtained, whilst fine hand movement to the wheelhead, vertically and transversely, permits grinding close to a shoulder or a die pin or locating dowels.

Precision surface grinding a die base fitted with locating dowels on a Lumsden No. 230X machine

The carriage, which supports the table and its driving worm and motor, slides on double vee ways, which are fully protected throughout their length. The table, which rotates on an oil bath track, can be either 30 or 48 ins. dia. and has individual motor drive giving two speeds of 8 or 16 r.p.m. The machine base, which is a heavy box section casting, houses the hydraulic pump and motor, the reverse and control valves and the oil tank.

Robust columns support the cross rail which carries the saddle and vertical grinding head. The motorised head has a 12 ins. hand down feed and is well supported on long slides at all positions. Thrust is taken up by spring loading and the whole head is accurately counterbalanced. Provision is made on the columns for adjustment to facilitate alignment of the wheel with the rotary table. The saddle, which is well supported on the flat ways of the cross rail, can be cross traversed to enable the rotary table to be used to its full capacity. The illustration shows one application of the No. 230X machine in a customer's works.

New Precision Split Mechanical Seal

THE new Sectaflex split mechanical seal introduced by Flexibox Ltd., Nash Road, Trafford Park, Manchester 17, provides a rotary seal in which the wearing parts are simply and quickly replaced without stripping down the shaft. Replacement of worn parts only entails removing a few screws, taking out the old parts and inserting new ones—a matter of minutes. Precision manufacture of the components ensures an extremely low leakage rate of the order of only a few c.c's per hour and the seals can be used at pressures up to 100 p.s.i.g. and temperatures up to 300°F. provided the vapour pressure at the operating temperature of

the fluid being handled is less than atmospheric.

The Sectaflex is a face-type mechanical seal in which sealing action is obtained by arranging for intimate contact between the rubbing surfaces of two assemblies, one of which is held stationary while the other rotates with the shaft. As these components are subject to wear they are each divided into two halves and assembled together in accurate alignment with the assistance of a solid locating ring. A third component, a flexible O-ring designed to prevent leakage along the shaft, is also split for ease of replacement. A feature of the design is the means adopted for ensuring that the rubbing faces are accurately aligned at right-angles to the shaft. This is effected by holding the stationary assembly firmly in a seal plate bolted to the stuffing box casing. Set screws in the seal plate enable the relative position of the stationary assembly to be varied within fine limits.

An exploded view of the Sectaflex split mechanical seal for sealing glands on all types of rotary equipment. Parts subject to wear are split for easy maintenance

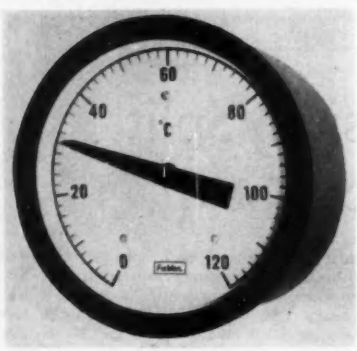
A variant of the basic design is also available in which provision is made for a positive circulation of the product being handled past the rubbing faces. This has the effect of (*a*) removing frictional heat, (*b*) preventing the settling of sediments, abrasives or polymers, (*c*) keeping seals handling hot products cool, and (*d*) keeping seals handling cold products warm.

Self-Balancing Electronic Temperature Indicator

THIS latest instrument to be announced by Fielden Electronics Ltd. is a precision self-balancing electronic temperature indicator. It is presented in a sealed case similar in size and appearance to a mercury-in-steel indicator or to a circular scale electrical meter and, in fact, the extensive tests carried out on the equipment have convinced the manufacturers that it is no more likely to require attention than a normal electrical indicating meter. Resistance bulbs are used as the temperature sensitive elements and with the inexpensive cable specified, these can be any distance from zero to 300 ft. away from the instrument without affecting the calibration or accuracy. This has been made possible by a newly developed measuring circuit. No trouble is experienced due to mains frequency pick-up on the leads to the resistance bulb since the circuit is operated at approximately 2,000 c.p.s.

The makers state that the indicating pointer is precisely positioned by one of the simplest servo-mechanisms of any self-balancing industrial instrument. Motive power is provided by a d.c. electric motor which has sufficient torque to ensure that the smallest temperature changes are faithfully followed. A number of standard ranges, both Centigrade and Fahrenheit, are offered, within the normal limits of resistance bulbs (minus 200°C. to plus 500°C.) but non-standard ranges with suppressed zeros and covering temperature spans down to 50°C. can also be supplied.

The instrument is claimed to have a calibration accuracy of 0·5% of range and reproducibility is better than 0·25%. It is particularly suitable for those industries where high accuracy, long term stability and trouble-free service are prime requirements. No specialised knowledge is required for the installation and the wiring between the instrument and the resistance bulb can follow the most convenient route. Cable replacement can be made without affecting the calibration of the indicator.

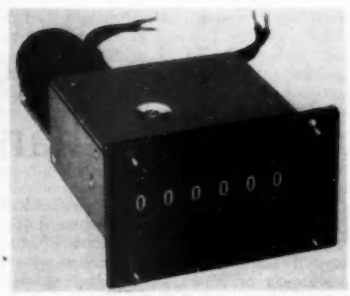


Fielden "Bikini" self-balancing electronic temperature indicator

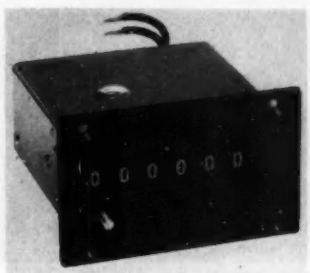
High Speed Quick Reset Magnetic Counters

AN entirely new form of electro-mechanical counter has now been added to the wide range manufactured by Veeder Root Ltd., New Addington, Surrey. This new model has a rated speed of 3,000 c.p.m. with a power consumption of 6 watts. Tests conducted show that a much higher performance is possible by increasing the power input above the rated 6 watts. Two forms of reset are available: (*a*) manual, by push-button on the counter front panel and (*b*) electrical by means of a solenoid, the power required being 15 watts.

The counter operating coils will withstand energising for long periods of time. Nylon components are extensively used in the construction and a compensating feature is incorporated to ensure proper tooth engagement between pinions and wheels, should the counter installations be subjected to temperature and humidity variation. Dimensions of the counter have been kept to a minimum to assist in bank assembly for panel mounting.



High-speed electrical counter with electrical reset



Electrically-operated counter with push-button reset

THE TEXTILE
COLOURIST & FINISHER

Use and Behaviour of Dye-Carriers in Dyeing Synthetic Fibres

A review of some of the results of various researches carried out by A.A.T.C.C. Amongst other interesting points it has been established that however a dye-carrier may influence dye absorption it does not do so by making the synthetic fibre being dyed more hydrophile

By B. C. M. DORSET

In recent years dye-carriers have acquired steadily increasing importance in dyeing synthetic fibres such as nylon, "Orlon," "Terylene," also the more recently introduced fibres "Courtelle," "Kodel," "Tricel" and "Arnel." Hydrophobic fibres are reluctant to absorb dyes compared with the natural fibres and only by having a so-called dye-carrier in the dyebath will they absorb sufficient dye to give medium and particularly deep shades. Without a dye-carrier it becomes necessary to employ high-temperature high-pressure methods of dyeing (say up to 125°C.) and this is not always convenient since such require special dyeing equipment.

Dye-carriers, usually organic compounds, include such substances as ortho- and para-phenyl phenols, benzoic acid, mono- and trichlorobenzenes, tripropyl phosphate, butyl benzoate, and methyl salicylate. They should generally be water-soluble or water-miscible, also capable of being absorbed into the synthetic fibres being dyed. In many instances such dye-carriers also have the power (in concentrated form) to swell or dissolve the synthetic fibres and dissolve the dyes applied. In the past, useful dye-carriers have been discovered by somewhat haphazard methods but today the principles underlying the usefulness of dye-carriers are being sought so that improved types may more readily be discovered and their application better controlled.

Experience has shown that while quite a large number of organic compounds are capable of facilitating the absorption of dyes by synthetic fibres only a few are really satisfactory considered from every viewpoint in dyeing. For example, a dye-carrier may be made valueless by a tendency (when left in the dyed synthetic fibre material) to lower the colour fastness properties. Similarly, a dye-carrier may have an unpleasant odour or tend to discolour during exposure to light, or be too volatile in the dye liquor. A dye-carrier can also add an appreciable amount to the cost of dyeing, so that active search continues throughout the world for improved dye-carriers.

It is surprising that there should be so much disagreement among dyers and dye-carrier manufacturers as to how a dye-carrier functions in the dye liquor, also what physical properties it should possess to have the optimum effect on dye absorption by the synthetic fibres. It is believed the accelerating effect on dye absorption promoted by a dye-carrier in the dyebath is due to one or other of the following factors:—

(1) Fibre swelling which allows the dye particles to enter more freely into the fibres.
(2) Solubilisation of the dye in the dye liquor so that the resulting finer dye particles can more easily penetrate the fibres.
(3) Dissolution of the dye in the dye-carrier to give a "composite" better able to enter the fibres.
(4) Internal loosening of the fibre structure (not necessarily accompanied by fibre swelling) capable of providing new sites attractive to dyes.
(5) Lubrication of the surface of the fibre molecules thus making them more mobile relative to each other and more favourable to passage of dye particles between them.
(6) Formation of a dye-carrier film on the surface of each fibre able to facilitate passage of dye particles from dye liquor into the fibre.
(7) A lowering of the hydrophobicity of the fibre due to absorption of the dye-carrier thus giving the fibres increased power to absorb organic substances, including dyes.

Behaviour of Dye-Carrier

Results of various researches in recent years covering one or more of the features mentioned indicate that the beneficial effect of the dye-carrier can arise from more than one aspect of its influence upon the dye or fibre involved. However, all this work together has failed to give any material degree of certainty about the behaviour of a dye-carrier in the dyebath and so the Piedmont Section of the American Association of Textile Chemists and Colourists recently appointed a research committee specifically to carry

out investigations which could establish basic facts about dyeing in the presence of a dye-carrier.

Their results (Amer. Dyes. Rep., 1959, **48**, No. 22, p. 23, and No. 23, p. 37) are especially valuable in so far as they do now allow more definite conclusions to be made as to the function of dye-carriers in general although, of course, the researches deal only with the behaviour of a limited number of dye-carriers and dyes. The research carried out by the Piedmont Section can be divided into nine main sections, each designed to establish a fundamental truth about some particular phase. Various fibres were employed including "Orlon" nylon, "Dacron," and the tri-acetate fibre "Arnel." Disperse dyes were mostly employed and the dye-carriers were those appropriate for the particular fibre being dyed.

One interesting fact now established is that however a dye-carrier may influence dye absorption it does not do so by making the synthetic fibre being dyed more hydrophile. This comes from an experiment in which fabrics of "Arnel" and "Dacron" were treated for 60 mins. at 95°C. in a liquor containing emulsified dye-carrier (tripropyl phosphate or trichlorobenzene or ortho-phenylphenol), then rinsed in water at 40°C. for 30 secs. and centrifuged to remove loosely adhering water, conditioned by standing over water in a dessicator at 25°C. for two days and then weighed; the increase of weight after a deduction for the absorbed dye-carrier was considered to be due to the imbibed water. The results obtained are set out in Table 1.

Table 1

Fabric	Dye-carrier Present	Water of Imbibition
"Arnel"	None	8·44%
"	4 g./litre Tripropyl phosphate	8·34%
"	5 g./litre Trichlorobenzene	9·25%
"Dacron"	None	1·63%
"	5 g./litre Trichlorobenzene	1·78%
"	5 g./litre Ortho-phenylphenol	2·01%

It will be observed that treatment of the triacetate and "Dacron" fibres with dye-carriers under approximately dyeing conditions leads to only a very small increase of their water of imbibition, although the presence of the dye-carrier in a corresponding dye liquor containing a disperse dye would lead to a considerable increase of dye absorption. The inference is that this increase of dye absorption does not arise from a kind of hydration of the synthetic fibre by the dye-carrier.

Following the introduction of tri-acetate fibre materials and in particular the introduction of "Arnel" it was found that this type of synthetic fibre was less receptive to disperse dyes than ordinary secondary acetate fibres and so search had to be made for suitable dye-carriers. This resulted in the discovery that tripropyl phosphate was especially efficient in dyeing the "Arnel" triacetate fibre. Fortess has recorded (Amer. Dyes. Rep., 1955, **44**, No. 16, p. 527) that an important characteristic of this dye-carrier is that it has a high solvent power for disperse dyes and that when present in a dye liquor it gives the liquor increased depth and brightness of colour suggestive of increased dye dissolution. It was actually found in the case of Lenra Yellow CW that this disperse dye is 33% soluble in pure tripropyl phosphate.

A further characteristic is that when "Arnel" is dyed in a liquor containing 10% of this dye-carrier the fibres absorb 2 to 3% of it (calculated on fibre) and that this is not removed by a simple rapid soaping. Fortess considered that tripropyl phosphate could act as an accelerator of the dyeing of "Arnel" by (*a*) increasing the solubility of the disperse dye in the aqueous dyebath, (*b*) forming a tripropyl phosphate film on the fibre surfaces and there assisting absorption of dye into the fibre substance and (*c*) entering the fibres and there loosening their structure to permit easier access for dye into the fibre, also freer diffusion of dye within the fibre. Cross sections of "Arnel" fibres dyed with a disperse dye such as Eastone Red GLF, with and without the presence in the dye liquor of tripropyl phosphate, indicate that without this dye-carrier "ring-dyeing" (the surface layer only is dyed) occurs whereas when the dye-carrier is present the dye becomes much more evenly distributed throughout the fibre substance.

Experimental Results

The above considerations can now be reviewed in the light of the recent researches by Piedmont Section. First, does the dye-carrier form a surface film on each fibre and thereby aid dye absorption? In one experiment, "Dacron" fabric was padded with an anhydrous dye liquor containing 85 parts of dye-carrier methyl salicylate and a blue disperse dye and was then placed between two glass plates and left in an oven at 95°C. for 60 mins. under a pressure of 10 lbs. (rapid evaporation of carrier was thus prevented). The fabric was then washed, dried, and its depth of shade measured. If all the dye had passed from the dye liquor in contact with the "Dacron" fabric into this fabric then a depth of shade corresponding to a 3·0 to 3·5% dyeing should have been obtained. Actually the dye transference gave a depth of shade corresponding only to a 0·1 to 0·15% dyeing. Even when some water was present in the dye padding liquor the resulting depth of shade was only equal to that of a 0·2% dyeing. The conclusion reached is that the presence of a film of the dye-carrier on the synthetic fibre surfaces would not materially assist rapid dye absorption. A similar result was obtained using trichlorobenzene as the dye-carrier for "Dacron" and "Arnel" fabrics.

Fortess also suggested that the beneficial effect of the dye-carrier (particularly tripropyl phosphate in dyeing "Arnel") can arise from a loosening of the structure of the fibres. If this is so, then it would be anticipated that if the textile material be first treated with the dye-carrier and this be then removed by washing (not followed by drying) then subsequent dyeing should be improved so as to give a deeper shade. There is considerable experimental evidence to show that synthetic fibres can by this method of pre-treatment be made more receptive to dyes. For example, according to B.P. 815,738 the dyeing of "Terylene" can be much assisted by first treating it with dioxane. Polyester fibres also dye to give deeper shades when pre-treated with diethylene glycol (Ratcliffe; Man-made Text., 1957, **34**, 61) even when this is washed out of the fibres before dyeing. Pre-treatment of secondary cellulose acetate fibres with triethyl phosphate at 80°C. followed by washing leaves the fibres more receptive to dyeing.

It has been reported by Olpin and Wood (J. Soc. Dyers and Col., 1957, **73**, 247) that diethylene glycol di-acetate has a mild swelling action on "Tricel" and is water-miscible so that if "Tricel" fabric is padded with a 60% aqueous solution of this substance and then after a short time washed, the fabric has much improved dyeing properties so as to be just as easily dyed as is secondary acetate fibre material; a similar treatment with a 30% concentration at 60°C. for 2 mins. gives a similar result. Other swelling agents (also dye-carriers) which are more powerful include acetic acid, acetone, and ethyl lactate so that the

treated "Tricel" can be well washed and yet retain an increased affinity for disperse dyes. Mellor and Olpin (J. Soc. Dyers and Col., 1955, **71**, 817) have found diethyl phthalate a much better dye-carrier for "Tricel" than phenol or tri-chloroethyl phosphate. A difference between diethyl phthalate and tripropyl phosphate is that the former is the more effective with pre-set than un-set "Tricel" fabrics.

It is difficult to test how far pre-treatment of a synthetic fibre material with a dye-carrier—with consequent loosening of fibre structure—is responsible of itself for improved dyeing properties. The reason is, that it is generally difficult to remove from the pre-treated fibres the considerable amount of dye-carrier absorbed in the pre-treatment. Simple washing is not efficient in most instances and if more drastic washing is employed (especially if it requires a high temperature) then any loosened fibre structure may collapse to give about the same original compact structure.

In the Piedmont experiments, "Kodel" and "Dacron" fabrics were pre-treated at 95°C. with 6 and 12% of butyl benzoate, ortho-phenylphenol, and methyl salicylate dye-carriers followed by washing (scouring with the aid of non-ionic ethylene oxide-phenol condensation products at 90°C.) and then dyeing with a blue disperse dye while comparative dyeings were also made with the dye-carrier present in the dyebath. Some of the results appear in Table 2.

It is seen that dyeing in the presence of the dye-carrier is more effective than dyeing after pre-treatment with the dye-carrier, yet without doubt the pre-treatment followed by washing does beneficially influence the subsequent dyeing. While it is not thus possible to separate satisfactorily the beneficial effects produced on dye receptivity by the pre-treatment itself and by the residual dye-carrier left in the pre-treated and scoured synthetic fibre material, it does seem likely that in the case of most of dye-carriers in use it is safe to conclude that the beneficial effect due to either cause arises from a loosening or other disturbance of the structure of the fibres. In fact, for a long time most dyers have felt that improved dyeing properties follow from the use of dye-carriers under conditions which allow fibre swelling with consequent structure loosening. A decision is thus desired as to whether fibre swelling by the dye-carrier is a necessary part of fibre structure loosening. Is it possible, for instance, for the dye-carrier to assist the loosening without having pre-swollen the fibres?

Table 2

"Kodel"	Depth of Dyeing
Untreated fabric, dyed	30
Pre-treated with 6% of butyl benzoate and dyed	40
" " 12% " " "	50
Untreated fabric dyed in presence of 6% of butyl benzoate	80
" " " " " 12% " " "	100
"Dacron"	
Untreated fabric, dyed	20
Pre-treated with 6% of ortho-phenylphenol and dyed	45
" " 12% " " "	60
Untreated fabric dyed in presence of 6% of ortho-phenylphenol	75
" " " " " 12% " "	100

Swelling Effect on Fibres

Piedmont Section measured the swelling effect on synthetic fibres of dye-carriers by two different indirect methods. First, was that described by Fortess (J. Text. Res. 1949, **29**, 23) and is based on the fact that if the sp. gr. of fibres is measured by a liquid immersion method then it will be smaller if the liquid penetrates the fibres without causing swelling but will then rise if the absorbed liquid produces fibre swelling. Thus the sp. gr. of "Arnel" and "Dacron" fibres were measured by immersion in dye-carriers trichlorobenzene and methyl salicylate, using a 50 c.c. pycnometer for this purpose. The sp. gr. were measured at 25 and 80°C. with completely dry fibres and with fibres which had first been heated with the water, trichlorobenzene, or methyl salicylate at 80°C. for two hours (such pre-treatment provided better opportunity for the liquid medium to penetrate and swell the fibres). The data where obtained is set out in Table 3.

Table 3

Liquid Medium	Sp. gr. of Fibres "Arnel"	Sp. gr. of Fibres "Dacron"
Water		
At 25°C.	1·3315 to 1·3306	1·3887 to 1·3895
" 80° "	1·2800 to 1·2842	1·3665 to 1·3659
" 25° " after heating of fibres	1·3211 to 1·3234	1·3905 to 1·3915
Trichlorobenzene		
At 25°C.	1·5829 to 1·2866	1·3827 to 1·3822
" 80° "	1·2254 to 1·2618	1·3535 to 1·3662
" 80° " after heating of fibres	1·3087 to 1·3080	1·4064 to 1·4051
Methyl Salicylate		
At 25°C.	1·3096 to 1·3087	1·3825 to 1·3862
" 80° "	1·2180 to 1·2134	1·3014 to 1·2899
" 80° " after heating of fibres	1·3409 to 1·3422	1·4137 to 1·4174

Such results are held to indicate that water penetrates both "Arnel" and "Dacron" fibres and that such penetration by the dye-carriers is greater for "Arnel" than "Dacron." It is evident that trichlorobenzene cannot be classed as a fibre-swelling agent and in fact (as the data show) exerts less swelling effect than water itself. Since this dye-carrier is very effective in promoting the easier dyeing of "Arnel" and "Dacron" fibres it must be concluded that it is not necessary for a dye-carrier to act as a fibre-swelling agent.

In the second indirect method for measuring the fibre-swelling action of dye-carriers attention was concentrated on the behaviour of "Dacron" towards three dye-carriers—ortho-phenylphenol, trichlorobenzene, and methyl salicylate. It was considered that any fibre swelling could be measured by the degree of yarn shrinkage which is generally observed to occur as a result of any treatment in which the fibres are caused to swell. Thus, the shrinkage of 70-den., 34-fil. "Dacron" yarns was measured while held under a tension of 0·029 grams in liquors containing various proportions of the dye-carriers at various tem-

Table 4

Dye-Carrier	Concentration in liquor	Yarn Shrinkage	Yarn Shrinkage Starts at:	Yarn Shrinkage Ends at:
None	— g./litre	4 to 5%	170°F.	212°F.
Ortho-phenylphenol	5·0 "	18 to 20%	130°F.	170°F.
"	2·5 "	10 to 11%	150°F.	180°F.
Methyl salicylate	7·5 "	12%	150°F.	190°F.
" "	3·75 "	11·5%	150°F.	190°F.
" "	1·825 "	8%	150°F.	190°F.
Trichlorobenzene	9·0 "	11%	150°F.	190°F.
"	4·5 "	11%	150°F.	190°F.
"	2·25 "	11%	150°F.	190°F.

peratures. The results are given in Table 4.

It is evident from these results that yarn shrinkage can be much higher with a dye-carrier present than with water alone and that a dye-carrier may cause shrinkage to commence at a lower temperature. For instance, with water alone shrinkage does not commence below 170°F. but with a dye-carrier present it can commence at 130 to 160°F. to reach a maximum at 170 to 190°F. In a separate experiment it was ascertained that yarn shrinkage to the extent of about 12% occurs when the "Dacron" yarn is dyed in water only under pressure at 260°F. Use of dye-carriers in the liquor allows this degree of shrinkage to be obtained at the lower temperature of 170 to 190°F. thus making satisfactory dyeing conditions much easier to ensure. An interesting point is that with the use of a dye-carrier which is effective at 170 to 190°F. (those used as described above are thus effective with "Dacron") it appears that fibre-swelling (as indicated by yarn shrinkage) takes place before dyeing since it is generally observed that appreciable dye absorption does not take place below 200°F.

The conclusion reached from these investigations concerning fibre swelling and dye absorption is that while fibre swelling is generally involved in the use of a dye-carrier it is not essential that every dye-carrier should be effective by reason of a power to swell the fibres being dyed—trichlorobenzene does not act by producing appreciable fibre-swelling. Yet the investigations of the Piedmont Section taken as a whole indicate that in dyeing with a dye-carrier it is important to know what this does within the fibre rather than in the dyebath. It is important in dealing with dye-carriers, say in their use or in the discovery of improved products, that attention should be directed particularly towards how they affect the structure of synthetic fibres since it is believed that their effectiveness is due more to a loosening of the fibre structure than to a solubilisation of the dye in the dye liquor or to a combination with the dye particles or to other features associated with the dye outside of the fibres.

Proceeding on this basis the view is taken that when the dye-carrier is absorbed into the synthetic fibres there simultaneously takes place a substitution of fibre-to-fibre bonds by carrier-to-fibre bonds. These latter bonds are weaker than the former. Considering now the amorphous regions of a synthetic fibre (it is generally agreed that the molecular packing in the crystalline regions is too close to admit of dye penetration) dye particles penetrate and accumulate via small "holes" in the fibre gel-like structure and that as the temperature of dyeing is raised so do the fibre-to-fibre bonds progressively break thus allowing the formation of more and possibly larger "holes" and the continued penetration of more dye particles. In dyeing with the aid of a dye-carrier with resulting formation of the weaker carrier-to-fibre bonds the formation of "holes" takes place more easily and at a lower dyeing temperature so that dye absorption within the amorphous regions is greatly facilitated. If the relationship between the dye-carrier and the fibre being dyed is such that no absorption into the fibres of the dye-carrier takes place then (as with tripropyl phosphate in dyeing "Dacron") no accelerated absorption of dye takes place.

Crystalline Regions of Fibres

So far, consideration has been given here to the dyeing of the amorphous regions of synthetic fibres and the absorption into these regions of a dye-carrier to have the effect of aiding a loosening of fibre structure such as might be brought about by a raising of the dyebath temperature. It thus appears possible that dye-carriers might be divided into two classes according as they are or are not effective in the crystalline regions of the fibres. Highly crystalline fibres are more difficult to dye than are those which have a high content of amorphous fibre substance. But not only do the various synthetic fibres differ among themselves regarding crystallinity but they differ as regards a special property whereby on heating to high temperatures and cooling they become more crystalline. The pre-setting of synthetic fibre fabrics to ensure that they retain their shape in wet processing (dyeing) involves such high temperature treatment and thus can give the fibres a higher degree of crystallinity and a consequent diminished power to absorb dyes. Cellulose triacetate fibres behave in this manner.

It is better for synthetic fibre goods to be dyed before being subject to high temperature treatments of this kind, when the result is an increase of fibre crystallinity. So it is useful to have dye-carriers which can affect the crystalline as well as the amorphous regions of the fibres. This aspect of dye-carriers has not yet been fully considered but it has importance in the selection of dye-carriers for "Tricel" as reported by Olpin and Mellor (J. Soc. Dyers and Col., 1957, **73**, 249). For dyeing the cellulose triacetate fibre "Arnel" it has been recommended in America to use tripropyl phosphate as the dye-carrier while in Britain for dyeing "Tricel" diethyl phthalate is the recommended dye-carrier. Comparison of these two dye-carriers has shown that the action of tripropyl phosphate is more confined to the amorphous regions of the fibre than is that of diethyl phthalate. Diethyl phthalate is therefore more useful in dyeing pre-set materials than is tripropyl phosphate.

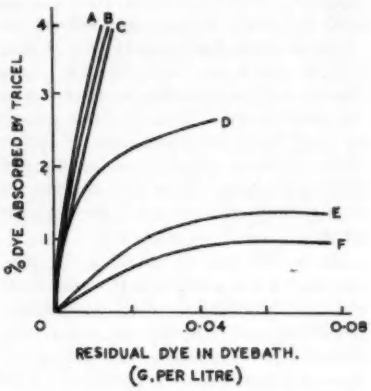
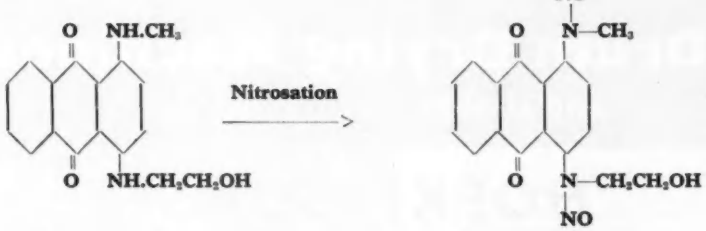


Fig. 1. Curves showing absorption by "Tricel" fabric of the disperse dye Eastone Fast Red GLF in dyeing for 2 hrs. at 80°C. A, B and C denote ordinary steam pre-set, and dry heat pre-set fabrics dyed in the presence of dye-carrier diethyl phthalate respectively. D, E and F denote similar fabrics dyed in the presence of dye carried tri-chloroethyl phosphate

The curves in Fig. 1 showing the absorptions of the disperse dye Eastone Fast Red GLF by ordinary and pre-set (by steam and dry heat) "Tricel" fabrics in the presence of diethyl phthalate and the dye-carrier tri-chloroethyl phosphate clearly illustrate how dye-carriers can differ in their effectiveness in the amorphous and crystalline regions of this type of fibre. Since steam-setting is often more effective than dry heat setting it is interesting to notice from the dye absorption curves, particularly when tri-chloroethyl phosphate is employed as the dye-carrier, that this product is less effective in promoting more rapid dye absorption with steam-set and than dry heat-set "Tricel" goods.

The use of dye-carriers in dyeing need not necessarily be for the purpose of accelerating the absorption of the dye itself—these products can also assist in preparatory stages which are required to enable the dye to be formed in the fibres from the dye components. For example, fast navy

blue and black shades on synthetic fibre goods can be produced by a treatment with a mixture of a diazotisable base and a coupling naphthol so as to cause suitable proportions of these to be absorbed into the fibres and then follow this by treatment with nitrous acid (resulting from sodium nitrite and sulphuric acid) which changes the base into its diazotised form to allow it almost simultaneously to couple with the naphthol and so form the dye. It has been found that with some synthetic fibres, notably "Dacron," that the action of the nitrous acid is slow and may require the temperature of the diazotising liquor (containing sodium nitrite and sulphuric acid) to be raised considerably above room temperature, although for other fibres this is quite unnecessary and would, in fact, result in some decomposition of the diazotised base during its formation. The presence in the synthetic fibres of a dye-carrier can assist this diazotisation stage. The Piedmont Section of the A.A.T.C.C. have demonstrated this point in a novel manner by making use of the fact that when a 1 : 4-dialkyl amino anthraquinone dye known as Disperse Blue III is diazotised or nitrosated it changes in colour from blue to red. This colour change results from the following chemical change —



(Blue) Disperse Blue III

(Red) Nitrosated form of Disperse Blue III

Thus, in a particular experiment pieces of "Arnel" and "Dacron" fabrics were treated with Disperse Blue III (butyl benzoate was the dye-carrier) so as to ensure absorption of this base. Thereafter the fabrics were scoured to remove excess of dye-carrier, and then one half of each piece were together treated with the same dye-carrier at 95°C. to allow a suitable proportion of this to become absorbed into the fibres. The whole of the halves of the pieces of fabric (with and without the final dye-carrier treatment) were then treated with a nitrous acid liquor (at 20°C. for the "Arnel" fabrics and at 70°C. for the "Dacron" fabrics) and the rate of their progressive change of colour from blue to red measured. In this manner the curves shown in Fig. 2 were obtained.

These curves show that the presence of dye-carrier butyl benzoate in the "Arnel" fabrics had scarcely any influence on the rate of nitrosation of the Disperse Blue III present, whereas it much assisted the nitrosation in "Dacron" fabrics. This difference is undoubtedly connected with the greater hydrophobicity of the "Dacron" fabrics. Obviously it can be very useful to employ a suitable dye-carrier in dyeing polyester fibres with azoic dyes which are formed from their components within the fibres.

At this stage it is worth recalling that it is that portion of the dye-carrier which enters into the fibre rather than the remainder which stays in the dye-bath that determines the extent of the influence of the dye-carrier on the dyeing process. It follows that absorption of the dye-carrier is just about as important as the subsequent absorption of dye. To a large extent this necessity for the dye-carrier to be absorbed into the fibres determines the types of substances which can be utilised as dye-carriers.

General experience in dyeing synthetic fibres has shown that for a dye to be readily absorbed it should be soluble in the synthetic fibre substance, i.e., it should be soluble in organic solvents rather than in water. A water-soluble substance applied from an aqueous liquor to synthetic fibres tends to remain in the aqueous liquor rather than to pass into the fibres. In the case of disperse dyes, it has been found that they should have at least some degree of solubility in water if they are to be successfully applied and allow the building-up of deep shades but this water-solubility can be quite low if the dye is in such a high state of dispersion that fresh dye passes into solution just as fast as dye is taken up by the synthetic fibres.

It has been noted that quite a number of disperse dyes are only water-soluble within the range of 0·005 to 0·01% and that these show a 50 to 70% exhaustion from the dye liquor at 90°C. within the first 10 mins., on say acetate fibres. So, a potential dye-carrier can be almost completely water-insoluble and yet be very effective. However it is better for the dye-carrier to have more water-solubility if the resulting absorption into the fibres allows this since there is always the risk of obtaining irregular deposition of the dye-carrier on the textile material if the dye-carrier has too low a water-solubility to allow it to form solid specks floating about in the dyebath. Such specks can become deposited irregularly on the fabric being dyed and at these points of deposition the high concentration of absorbed dye-carrier will attract dyes very strongly to give specky dyeings. The water-solubility of a dye-carrier is thus important.

The fact that absorption of the dye-carrier is necessary provides another problem to the dyer. If the dye-carrier is strongly absorbed by the synthetic fibres, then there is an equally strong possibility that removal of the dye-carrier by washing after dyeing will be difficult. And yet in most cases it is desirable that in the final dyed and washed material there should be left an absolute minimum residue of dye-carrier. Residual dye-

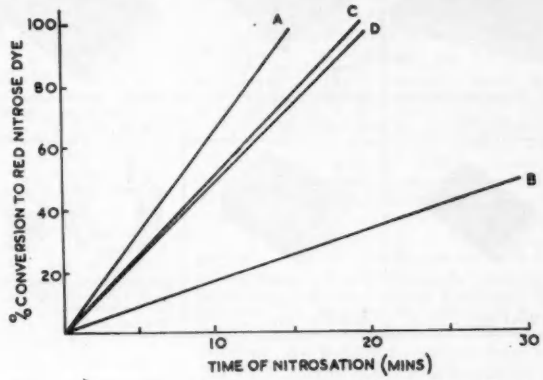


Fig. 2. Curves showing how the conversion within "Dacron" and "Arnel" fibres of Disperse Blue 3 into its red nitroso form is accelerated by the presence of the dye-carrier butyl benzoate within the fibres at the time of their treatment with a nitrous acid liquor. A and B are the nitrosation (at 70°C.) curves for "Dacron" with and without the presence of the dye-carrier respectively. C and D are similar nitrosation (at 20°C.) curves for "Arnel"

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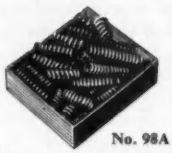

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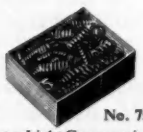

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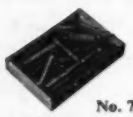

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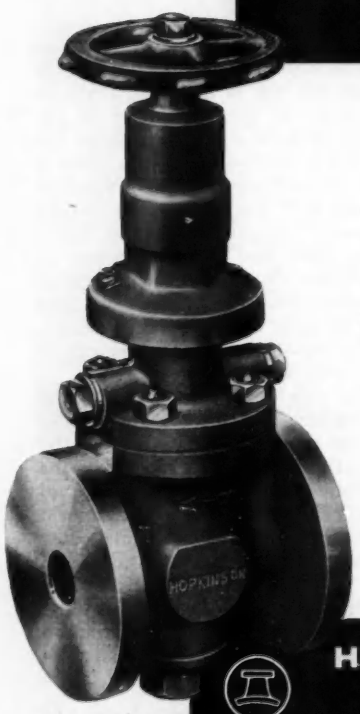

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carrier can adversely influence the fastness properties of the dyes applied and it can also have an undersirable effect on the physical properties of the textile material during its storage and use especially if during this time the material is exposed to high temperatures or to light.

In considering the dilemma arising from these two desirable but opposing properties in a dye-carrier—that it should be strongly absorbed by the fibres and yet after dyeing be easily washed out—it would seem that there is at least one possible solution. This is that the dye-carrier should be a type of substance which is only strongly absorbed from an aqueous dye liquor if there is also present another substance (not absorbable by the fibres) which assists dye-carrier absorption. Then, in the final washing following dyeing and with this assisting substance not present in the washing water the dye-carrier should be easily and almost completely washed out of the dyed fibres. By research it should be possible to discover complementary dye-carriers and assisting substances of this kind.

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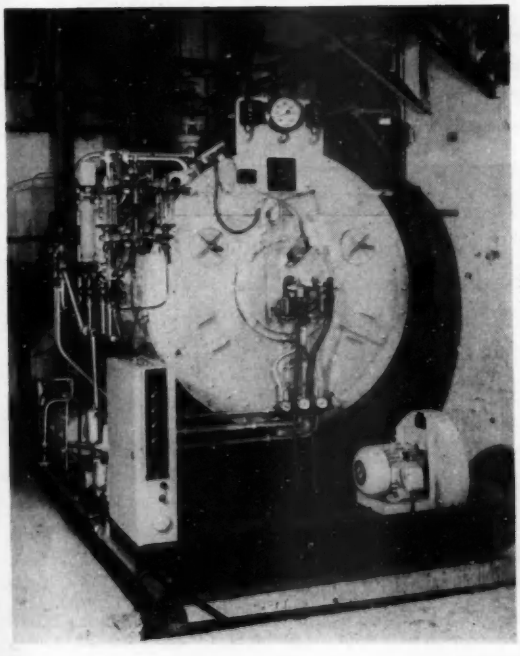
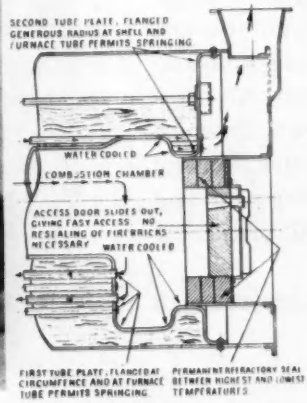
Design has been concentrated successfully on reduction of unequal stresses arising from rear tubeplate temperature variation. To achieve this the boiler is of semi-wetback construction incorporating two independent rear tubeplates, the first of which receives the high temperature gases leaving the furnace, the second being contacted by the cooler outgoing gases. This design is said to eliminate any risk of damage by overheating and uneven heating of the rear tubeplate and combustion chamber, at the same time ensuring that an increased proportion of the hotter gases is contained within the waterspace to give maximum efficiency. Maintaining an efficiency of between 80 - 84% and a CO_2 of 13·5% to 14%, the boiler is part welded and part riveted, with flanged tubeplates, a construction which facilitates extreme flexibility; (steam can be raised rapidly from cold in approximately 30 - 40 mins.) and a lively response to fluctuating loads. This type of construction also dispenses with water space firebox stays, resulting in the complete elimination of leakage from this source. Another feature is that the comparatively few firebricks in the combustion chamber are thus easily and inexpensively replaced. The cooling effect of the semi-wetback is claimed to ensure years of trouble-free use without the need of replacements. Manufactured to British standards requirements, the boiler is mounted on a frame for convenient delivery to site or cased for export. All boiler shell mountings are flanged and substantially constructed.



(left) The Cradley "Steampacket" boiler

(below) End portion of the boiler showing two rear tube-plates


SECOND TUBE PLATE, FLANGED GENEROUS RADIUS AT SHELL AND FURNACE TUBE PERMITS SPRINGING
WATER COOLED
COMBUSTION CHAMBER
ACCESS DOOR SLIDES OUT, GIVING EASY ACCESS NO RESEALING OF FIREBRICKS NECESSARY
WATER COOLED
FIRST TUBE PLATE, FLANGED AT CIRCUMFENCE AND AT FURNACE TUBE PERMITS SPRINGING
PERMANENT REFRACTORY SEAL BETWEEN HIGHEST AND LOWEST TEMPERATURES

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A medium-pressure air type burner is fitted providing two-stage mixing and swirling of oil and air. Fully automatic the burner provides extremely powerful atomisation and efficient combustion. The flame is automatically controlled by the "Hi-Lo-Off" device; i.e., it is automatically reduced should the demand for steam fall. If the demand for steam is exceptionally low or ceases altogether the flame will go out, to be automatically re-lit electrically immediately steam is again required. An interesting feature from the operators' viewpoint is the ease with which the burner can be released; unscrewing a wing bolt allows it to be quickly removed for inspection and cleaning. Similarly by turning a cam lever the electrode ignition assembly can be easily removed.

Safety devices included comply fully with insurance companies' rules for unattended boilers—primary and secondary cut-offs. The burner cut-off and an alarm bell rings in the event of low water. In case of flame failure a photo-electric cell cuts off the burner whilst should draught fail, a pressure switch shuts down the burner immediately. A high steam cut-off pressure switch shuts-off the burner at pre-set pressure and automatically relights on fall in pressure. In addition a special anti-shock device known as a "Grad-U-Start" eliminates blow-back on lighting up.

Full details will be gladly supplied by the manufacturers.

New Season's London Wool Sales

There will be nine series of fortnightly wool sales for the 1960-61 season compared with eight last year, announce London Wool Brokers Ltd. They will be held on September 12; October 24; November 28; January 16, 1961; February 20 (ten days), 1961; March 20, 1961 (one week); April 24, 1961; May 29, 1961 and July 3, 1961. London sheepskin sales will be held on October 6 next and April 7, 1961. There may be further sales if more quantities are available.

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APV HEAT EXCHANGERS PUT WASTE HEAT TO WORK

These APV Heat Exchangers will help you to recover heat from processed liquids or effluents that would otherwise go to waste. In numerous installations they have paid for their cost in a remarkably short time.

THE APV ROSENBLAD SPIRAL HEAT EXCHANGER.

Compact, and giving exceptionally high heat transfer rates, the APV Rosenblad is available in three basic types, one or more of which will handle saturated gases, vapours, liquids over a wide range of viscosities, or even sludge. The Rosenblad has been used successfully to recover heat from hot dye effluents, waste process steam, boiler blowdown water and de-benzolised gas oil, to mention only a few applications.

The illustration above shows the internal construction of a Rosenblad Spiral Heat Exchanger for liquid/liquid duties. APV Publication No. A334a gives further details.

THE APV PARAFLOW PLATE HEAT EXCHANGER.

The APV Paraflow is highly efficient in the recovery of heat from corrosive, potable and other liquids. It combines extreme compactness with flexibility of operation. An especially valuable feature is the ease with which the unit can be opened up for inspection and cleaning. Any plate can be removed and replaced in a few seconds without disturbing the remaining plates.

The Paraflow's past successes include such widely differing liquors as hot ammonia liquor from gasworks, waste sulphite liquor from paper manufacture and bottle-washing effluents.

Illustrated is the Paraflow Type HXC; for wall mountings. For particulars of the full range send for Publication No. A340.

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Procion/Alkali Mixer Minimises Hydrolysis Losses

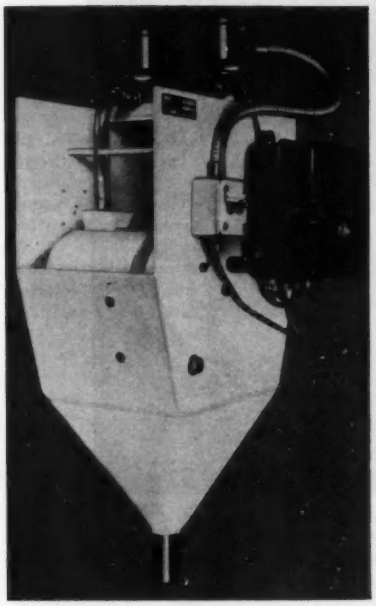
THE mechanism of dyeing cellulose with reactive dyes of the "Procion" type is the chemical reaction that occurs between reactive chlorine atoms in the dye molecule and hydroxyl groups in the cellulose. When the system is made alkaline, the dyes react preferentially with the cellulose hydroxyl groups rather than with the hydroxyl groups of the water. Nevertheless, quite a substantial percentage of colouring matter is inactivated, and therefore lost, by hydrolysis with water. Where double padding—i.e., padding of dye solution followed by padding of alkali—is employed, as in the pad(dye)-pad(alkali)-steam processes, losses by hydrolysis are automatically minimised since the reactive dye is exhausted on to the cellulose before it has reacted with the alkali necessary to effect development. Double-padding methods were the first to be adopted and recommended when I.C.I. first introduced reactive dyes, but experience since has shown that single-padding methods are quite practical and preferable provided precautions are taken to ensure that the dye/alkali padding liquor is not allowed to stand for unduly long periods before being padded on to the fabric.

The alkali employed varies, depending on the dyeing method selected and other factors, but is either sodium bicarbonate, sodium carbonate, sodium metasilicate or caustic soda. Dye solution and alkali solution are prepared separately and mixed in the correct ratio immediately prior to (or as late as practically possible prior to) padding. As a precautionary measure, when one of the stronger alkalis is used, as in the pad-batch process, the material may be padded in lengths of about 500 yds. (metres). These can be padded in less than 10 mins. and, as each batch is completed, a fresh lot of padding liquor is prepared, and since the changeover to the next batch takes only 2 - 3 mins. the liquor remaining in the pad trough need not be discarded. A more satisfactory procedure, however, is to mix the two solutions accurately and continuously as the padding liquor is fed into the pad trough, but this pre-supposes the availability of a suitable apparatus for carrying out the necessary mixing and addition.

The need for an efficient automatic premixing device was early appreciated by I.C.I. Dyestuffs Division, and a piece of equipment was designed and constructed in the laboratories at Blackley suitable for cloth running speeds of up to the equivalent of 4 gallons (18 litres) of pad liquor/min. This apparatus proved eminently satisfactory in extensive trials and, with the growing popularity of pad (dye + alkali) methods of applying reactive dyes, it was decided to make the equipment available commercially. Arrangements were accordingly made for Horsfall Engineering Co. Ltd., Ironmonger Lane, Oldham, to undertake manufacture of the machine under licence from I.C.I.

Operation and Construction

This fully automatic machine actually gives discontinuous mixing and feeding of the solutions of dye and alkali but, since the amounts fed to the mixing zone are small compared with the volume of the pad trough, the method has all the advantages of a continuous feed. The machine operates on the principle of a container balanced in such a way that it tips as soon as it is filled to a certain level. The construction of the complete apparatus and tipping containers are shown in the illustrations.

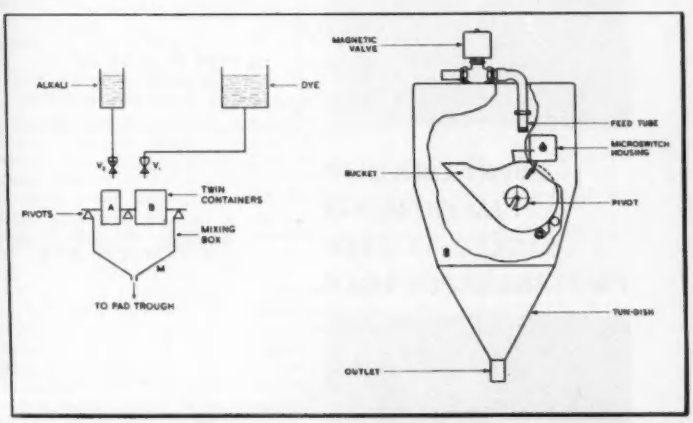


Close-up of the "Procion" alkali mixer clearly shows the robust construction

The smaller of the two containers is for the alkali solution and the larger for the dye solution. The volumes of the two containers are in the ratio of approximately 1 : 7 since experience has shown that the ratio of the volumes of alkali solution and dye solution, when using convenient concentrations of each, are in roughly this proportion. Alkali solution is delivered to the smaller container (A) via the magnetic valve V_2. When this container begins to tip a microswitch operates, closing valve V_2 and opening valve V_1; at the same time this container is prevented from tipping further by a stop on the larger dye container. Dye solution is now delivered into the larger container via magnetic valve V_1,

View showing the mixer fitted on the side of the machine

(below) Diagrammatic representation of the complete apparatus



1825 1835 1845 1855 1865 1875 1885 1895 1905 1915 1923 1935 1945 1955

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1960

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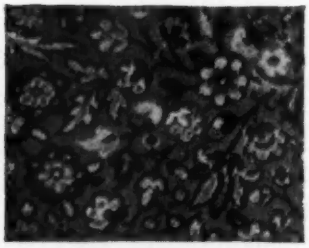
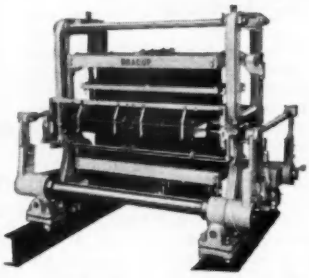
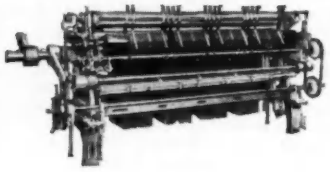




Heavy duty matting Jacquard for SISAL and COIR matting. Available in all sizes up to 24/4.



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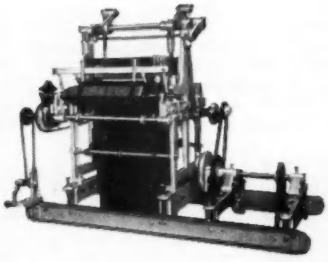

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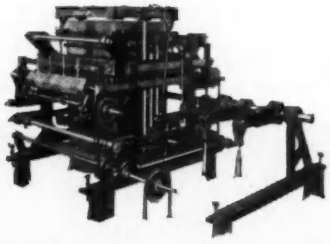

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and when this container begins to tip, a second microswitch cuts off the valve. Both containers now tip over, discharging alkali and dye solution into the specially designed mixing box M from which the combined liquors run into the padding trough. The emptied containers then swing back to their original position and the cycle repeats itself.

The mixer also makes provision for constant level control of the pad trough by means of an Aquatrol (Fielden Electronics Ltd.) conductivity relay that operates by switching off the valves when the liquor level in the pad trough touches the probe which is set to the correct level of the trough. The time for a complete cycle depends on the feed rate of the dyestuff and alkali but the lower limit is about 10 secs./cycle. The standard container of two-thirds of a gallon (3 litres) therefore provides for flow rates up to 4 galls. (18 litres) per min.

The "Procion"/alkali mixer is robustly constructed and simple to operate and maintain. The mixing box and tilting containers are made of "Darvic" grade polyvinyl plastic sheet, which is easy to clean. All metallic components in contact with dye and alkali are stainless steel. Changeover from one shade to another is effected simply and rapidly. The storage tanks for the dyestuffs and the alkalis may be connected via a stout rubber tube either by gravity feed or by two small centrifugal pumps to the valves V_2 and V_3 and there is easy access to all parts.

One of the attractive features of reactive dyes has been their adaptability and amenability to operation in established equipment, in dyeing applications and printing applications alike. The rapid growth in their use and firm establishment in favour have taken place without any special mechanical aids, having been brought about by the intrinsic technical merits of these new colouring matters. The advent of the mixer is both a recognition of the established position of reactive dyes and a useful contribution to future expansion to their use, particularly in the cellulose piece dyeing field, and is proving very satisfactory in use.

Keighley Textile Society

Mechanical Faults in Textile Processing

"FAULTS in some form or another, whether due to the material being processed, machinery on which it was processed, or the handling of the material, would appear inevitable at some time or other," said Mr. E. J. D. Poole, F.T.I., F.R.S.A., Assoc.B.T.C., in a lecture given recently to members of the Keighley Textile Society. The present subject, he said, was concerned with such occurrences which led to some irregularity or fault at any stage of mechanical processing in connection with textile manufacture, and such faults may not only occur during the conversion of fibres into yarn, yarn into fabric, fabrics into finished material, but also during the conversion of the materials for their specific purpose, e.g. cloth into garments, upholstering, general furnishings and other purposes. The first essentials in the investigation of any problem were:—

A. An accurate description of the problem or complaint.
B. General inspection with particular reference to quantity.
C. Detailed inspection, for which purpose various means available are made use of, according to the nature of the problem, e.g.,
- **(i) A cloth perch with appropriate lighting.**
- **(ii) A piece table with transmitted light unit.**
- **(iii) A swivel table for critical angles of viewing.**
- **(iv) The microscope.**
- **(v) Ultra-violet light.**
- **(vi) Physical and chemical tests.**
- **(vii) Improvised means of testing and of simulating specific conditions.**

Apart from specific damage or some actual re-arrangement of particular units, faults or complaints usually became a matter of comparative degree. From the actual description of a fault, its character should be clearly revealed, and from the subsequent inspection, various features of the problem should be observed and ultimately examined in the necessary detail.

An essential aspect of any complaint was its history, and if the complete history could be obtained, it should be possible to trace and solve the precise origin or manner in which the fault had developed. Apart from the isolated exceptions where such a history could be supplied, it was only possible to reach a somewhat incomplete conclusion, dependant upon the amount of history and detailed information available, and in consequence, the conclusions may be accurate to that extent. A number of interesting examples representing a small cross-section of the various stages of mechanical processing demonstrated a number of basic features governing faults. In one instance, the effect of cloth appearance was related to yarn levelness and the method of fabric construction showing that it appeared inadvisable to construct colour and weave styles by using two threads, working as one in combination with threads working one as one. Under such circumstances, the normal irregularities in the latter appeared to have caused an irregular displacement of the former, resulting in a mottled appearance on the surfaces of the cloth. This was a feature well-known in tapestry designing where such methods of construction were considered impracticable.

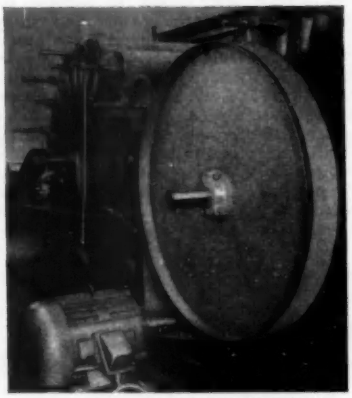
Irregularity in yarn was illustrated in another form—periodicity; a known cause of cloth patterning. This may be concerned with yarn count, shade, twist, and other aspects which may be prone to a periodic arrangement or disturbance. Here, storage problems assume increased importance. When twist re-distribution occurs in a regular manner, e.g. during twisting or rewinding, such yarn left on cheeses for some time, caused the twist unevenness to become fixed and thus produce patterning.

Tension was a further factor of basic concern, he continued, and examples illustrated the influence of decoration thread tension on the appearance of the cloth, whereas in other instances differential tension introduced by a weave caused cracking of the yarn to occur during tentering. Another fault which may be regarded in a somewhat absolute sense is that of mixing similar yarns—these yarns being considered identical from a practical standpoint, but processed on different machines or at different times on the same machine, or likewise from different lots of tops purported to be identical. Faults of this character, whilst not of a high proportion throughout the entire industry, do occur too frequently. Despite a basic established procedure, which can be followed; namely, the mixing of such yarns end-and-end in the warp. If mixed otherwise, a regular stripiness—warp way may develop—in proportion to the number of ends grouped together, a common arrangement being 8 and 8. This fault was due to either incorrect instruction, misunderstanding, or carelessness. These faults were often not visible until after dyeing and finishing; some, however, could be detected in the grey state cloth by ultra-violet light examination.

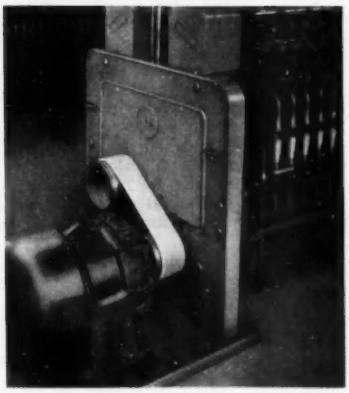
Numerous other miscellaneous examples demonstrated the unexpected or accidental occurrences in the course of handling: mechanical manipulation due to damaged or unsatisfactory accessories, e.g. cutting of weft by a sharp reed wire, plucking of weft by a rough reed; contamination of warp yarn by metal due to the use in one instance of unsatisfactory false reed wires, e.g. soft iron, tinned copper and copper wire, whilst similar contamination could arise from deposits of lead from the tinning process in the production of heald wires. In the case of false reed wires, it was recommended that bright steel wire be used and in the case of the heald wires, that gears or shafts should not have new wires added unless the obvious precaution is taken to have the wires thoroughly cleaned and rendered free of any lead deposit; this procedure was quite common in connection with droppers used on warp stop motions. It would therefore have been advisable to stress this aspect of cleaning accessories rather than suggest that no serious trouble would result (especially in connection with false reed wires or heald wires) if the whole of the wires were in fact, alike and equally spaced across the warp. Finally, the displacement of such accessories from their proper working position was liable to cause yarn abrasion accompanied by metal contamination and in one

There's not much....

MAIN DRIVE



CARDING ENGINE DRIVE



RING FRAME DRIVE

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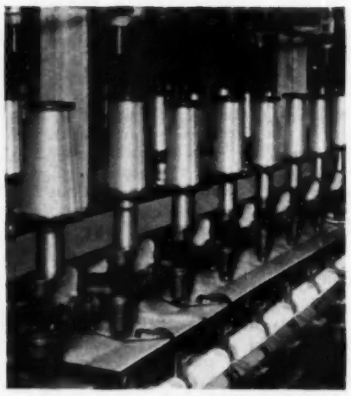
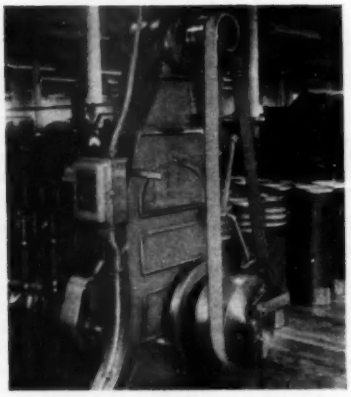
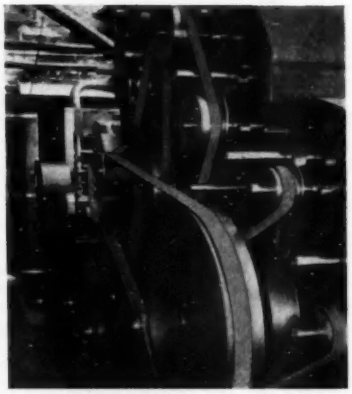


UPTWISTER DRIVE



FAST/LOOSE DRIVE



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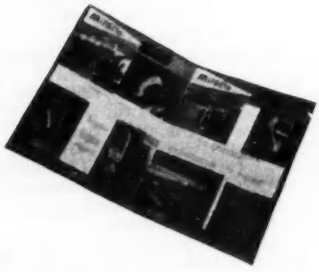

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or other instance dyeing was liable to have been effected.

Mr. Poole then referred to faults arising in the finished product, a typical example that of the rubbing-up of a bird's-eye suit, in which was shown that inadequate control of the fibres by twist in the component single yarn of one of the two-fold yarns used for the cloth had caused fibres to work on to the surface and produce an unsatisfactory appearance. The other yarn used, obviously had sufficient resultant or residual twist in the component singles to prevent such a fault developing. As a result of practical trials it was recommended that in such two-fold yarns at least 15% of the original spinning twist should remain in the component singles after twisting. Regarding clothing manufacture, two basically important aspects were illustrated and described in some detail: the mixing in one garment of panels cut from different pieces of the same delivery of cloth, and pick-and-pick styles or decorated styles where the design or construction was "one-way" or not balanced; this did not mean that the construction or design of the cloth was in any way imperfect—it was, in fact, an aspect of cloth construction and design apparently not yet fully appreciated by the clothing manufacturer. In such cloths, it had been proved inadvisable to cut panels for the same garment in opposite directions of the cloth; the fundamental reason being that with such styles, the arrangement of the different yarns was in one order, e.g. a grey pick-and-pick; the odd picks could be dark and the even picks light, or vice versa; hence, if the cloth was turned round, the picks would consequently be in the reverse order. This reversing of the cloth in the cutting on the lay also applies to solid shades, being particularly concerned with the finishing bias of a cloth—this likewise was an aspect of manufacture not yet apparently, fully appreciated in clothing manufacture. All cloths appear to have possessed a finished bias and this aspect like the one-way style or design of cloth could be considered as imperfect processing. It was, therefore, suggested that a matching trial be made by the clothing manufacturer in order to determine whether or not a cloth may be reverse cut.

There were many other aspects which appeared to be rightly placed with the clothing manufacturer concerning stitching methods and stitches per inch. Faults such as slipping and breaking away, at the seams and cockling along the seams were typical examples of stitching problems. Miscellaneous examples together showing the effects of needle scratches and blunt needles were shown with an example which demonstrated the serious effect of inadequate length of the interlining in a waisted style jacket; the edge of the interlining (referred to as a "brush edge" owing to its stiffness) had caused breakdown of the yarn during the course of a relatively short period of wear. The effect at first sight appeared to have originated from the outside of the garment due to its contact with some object carried by the wearer. In fact, the disturbed appearance of the outside surface was offset by the gross disturbance and breakdown in a corresponding line on the inside of the garment which also agreed with the edge of the interlining.

The Lecture concluded with demonstations of the cause of "skew"—a natural characteristic of particular cloths, and a recommendation was made allowing such cloths to assume their natural form and that the clothier or the manufacturer should cut at right-angles to the list for the straight edge required for the clothiers' "lay." Such cloths should not be torn to obtain a straight edge as appeared to be a customary practice in the clothing industry, nor should they be straightened by the finisher. The problem of check-styles and designs requiring matching also presented certain difficulties.

Society of Dyers and Colourists

New Work on Dyeing Nylon with Disperse Dyes

DISPERSE dyes which were the ones most commonly used for man-made fibres had very good dyeing properties on nylon but their fastness properties were only moderate, stated Mr. H. Seaman, B.A. (I.C.I. Ltd., Dyestuffs Division) in a recent talk to the London Section and the West Riding Sections of the Society of Dyers and Colourists. With the increasing variety of nylon textiles and the growing demand for better fastness, particularly washing fastness, it had been necessary to resort to the use of water soluble dyes which were, in general, much inferior in dyeing properties. A new approach had now been made to dyeing nylon by the introduction of reactive disperse dyes, called Procinyl dyes, which combined the attractive dyeing properties of disperse dyes with the excellent washing fastness of reactive dyes.

The evidence that reaction occurred between the Procinyl dyes and polyamide fibres was briefly described and illustrated by slides and the effect of dyebath pH on the exhaustion and fixation of the dyes was discussed. Although the exhaustion was not greatly affected by variations in pH, the fixation was very low under acid conditions (pH 3 - 4) and increased to a maximum at about pH 10. The effects of dyeing time, temperature and liquor ratio on both exhaustion and fixation were also described. From this data, the preferred dyeing method was shown to be a two-stage, one-bath method. The dyes were initially applied from an acid bath (pH 3·5 - 4·0) at 95°C. Under these conditions, the dyes exhausted on to the fibre, but little reaction took place. They, therefore, had dyeing properties very similar to those of disperse dyes. The dyebath was then made alkaline by the addition of soda ash and dyeing was continued for a further hour. The dyes then reacted with the fibre.

It was explained that dyeing irregularities in nylon could be classified as chemical or physical irregularities. Chemical irregularities were caused by variations in the amine end-group content of the yarn. Whilst they did not affect disperse dyes, they did affect the equilibrium uptake of anionic dyes. The primary amino groups should be the most reactive points in nylon polymer and Procinyl dyes might not therefore be expected to cover chemical irregularities. However, by dyeing a heavy shade of Procinyl Blue R on nylon and the same nylon after acetylation, it was shown that, although acetylation reduced the number of amino groups to one sixth of its original value, the exhaustion was only slightly reduced and the fixation was only reduced by half. From this it was concluded that Procinyl dyes covered chemical irregularities very well and that reaction took place at other points in the polymer molecule. By normal dyeing trials, it had been established that Procinyl dyes gave excellent coverage of chemical irregularities.

Physical irregularities, which were more common, affected the rates of dyeing of all dyes, the effect being least noticeable with disperse dyes which, in general, had small molecular size. In the case of Procinyl dyes, quantitative measurements had been carried out in nylon fibres varying greatly in draw ratio. From the results it was concluded that by dyeing in an acidic dyebath, good coverage of the physical difference was obtained whilst, dyeing under alkaline conditions gave poorer coverage of the difference. By using the two-stage acid/alkaline process, perfect coverage was obtained. In practice it had been found that the Procinyl dyes were slightly inferior to the very best disperse dyes, equal to many disperse dyes and superior to water soluble dyes in their coverage of this type of irregularity.

The Procinyl dyes were suitable for use in winches, paddle machines, circulating machines, jigs, which should preferably be enclosed, and most other types of machine. The continuous dyeing of Procinyl dyes had not, so far, been fully investigated, but the pad roll method of dyeing had been found to give very high colour value and washing fastness. The fabric was padded with the dispersed Procinyl dyes sodium bicarbonate, wetting agent and thickener, batched and developed for 2 to 4 hours at 95°C. Loose dye, thickener, and alkali were then removed by a short "soaping" treatment.

The fastness properties of the Procinyl dyes on nylon 66 were illustrated. In fastness to wet and heat treatments, the Procinyl dyes, applied at 95°C., were shown to be much superior to disperse dyes. In the more severe washing treatments, the Procinyl dyes were also shown to be superior to acid dyes. When dyeing temperatures of 85°C. were used, the washing fastness was slightly reduced but at temperature below 80°C., the reduction in fastness became more serious. However, heat setting after dyeing improved the fastness of such dyeings considerably. On nylon 6, the fastness properties of the Procinyl dyes were very similar, if not identical, with those on nylon 66.

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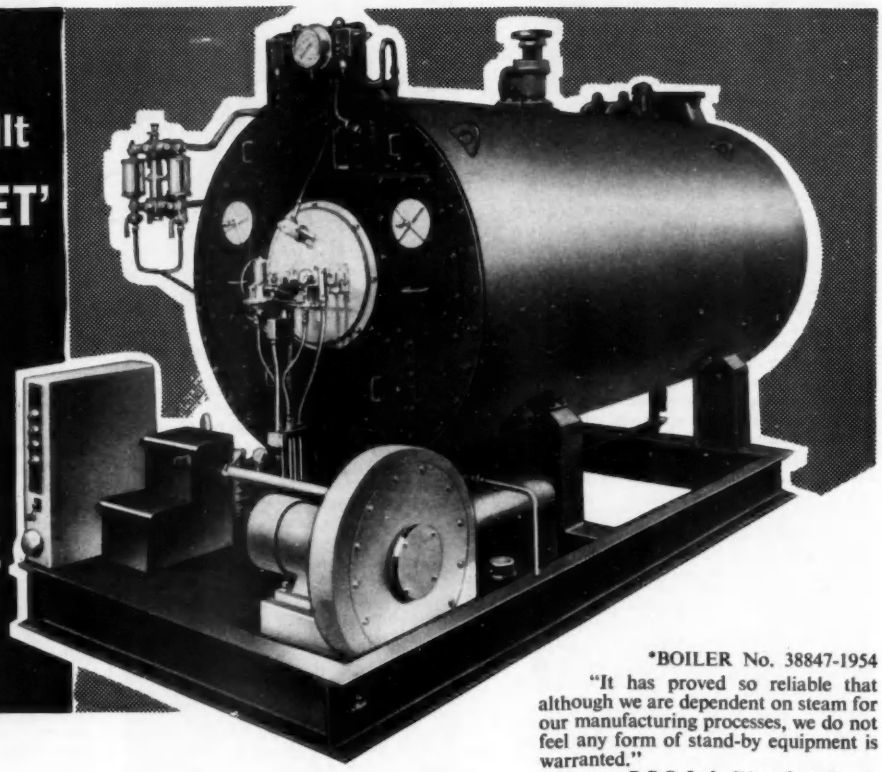

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Textile Trade and Prospects

Linen Trade Review

There has been an appreciable decline in demand for raw material in recent weeks, with an accompanying drop in price levels, particularly for low grade fibre. While spinners generally are fairly well covered for the off season it is a significant fact that this sudden lack of interest coincides with a reduction in the volume of new business booked in the spinning and weaving sections.

With more favourable conditions pertaining for outdoor work activities have been switched from scutching to retting. Stocks of 1959 retted straw are now practically exhausted. No assessment can yet be made of the possible acreage of the 1960 crop. Reports from Continental sources suggest a definite increase in France. In Eastern Europe also the Planning Authorities have budgeted for an increased sowing. Whether this will be reflected in an expansion of exports to West European manufacturing centres is uncertain in view of the rapidly expanding Soviet linen industry, and its proclaimed intention to compete in world markets. In the meantime manufacturers have sufficient business in hand to keep spindles and looms running at current production rates for some months, and they are not unduly concerned with the long term outlook, especially in view of uncertainty regarding supplies and prices of 1960 crop flax.

The present level of activity tends to convey a false impression of prosperity, for it relates to an industry which has contracted considerably in recent years. Current total output of linen manufactures represents a relatively small percentage of the productive capacity available ten or fifteen years ago. A considerable number of spindles and looms at present in production are engaged in processing man-made fibres, and the increasing competition of these, as well as the trend of consumer demand stresses the urgent need for more active research and experiment on ways and means to expand the market for man-made fibre yarns and fabrics produced on flax type equipment or, alternatively, for the inclusion of more specialised processing machinery for this purpose in current re-equipment schemes.

The extent to which man-made fibre products have invaded markets formerly exclusive to linen constitutes a serious challenge to the latter in its personal, household and industrial applications. The merits of the former could not be matched by linen in the field of *haute couture*, even with the aid of modern finishing treatments. The success of rayon/cotton blends for table damasks, and of nylon in competition with bed linens, constitutes a challenge that calls for more positive action than has yet been taken to meet it. While the drip-dry non-iron merits of man-made fibre products cannot be matched by comparable economies with linen preference for the latter could be stimulated at the initial stage by widening the price gap in its favour. This would involve revolutionary changes in traditional manufacturing practice which British linen manufacturers have shown little inclination to adopt to date, even when re-equipment schemes are being put into operation.

Upward of £15 million has been spent in post-war years on re-equipment, approximately half of this by the spinning section. The fact that many re-equipped units have since ceased production is evidence that re-equipment on short-term planning is unsuited to the rapidly changing conditions in the textile industry today and in the consumer markets which it supplies. Nor will the expense of the initial scheme write finis to the account, for the cost of obsolescence will undoubtedly rise with the rate of improvement in manufacturing technique.

It is unfortunate that the increasing tempo of technical progress has tended to discount manual skills, which have contributed much to the range and appeal of speciality lines. These have constituted an important source of revenue in the past, which could undoubtedly be expanded. It is most important that the potential market value of these specialised skills should not be entirely ignored in an age that places increasing reliance on the machine and the economies of automation.

World Record Wool Imports

The fourteen main wool importing countries of the free world bought about 22% more raw wool last year than in 1958, reports the Commonwealth Economic Committee in the current issue of Wool Intelligence. The total came to over 2,600 million lbs. (actual weight) and is believed to be the highest ever recorded. Largest proportionate increase was in the U.S., with a 50% rise. Japanese imports were up by over one-third, and the U.K. (world's largest user of wool) showed a 14% improvement. The six common market countries together registered an increase of 16% in their wool imports, compared with 1958. World exports of wool tops also set up a new record in 1959, when they reached 240 million lbs., or about one-fifth more than in the previous year. In the final quarter of the year, however, there were signs that the rise had begun to level off. The U.K. remained the largest single supplier, and her top exports rose by 8%. Striking improvements were recorded by West Germany, Japan and South Africa, while traditional producers such as France, Belgium and Australia showed increases of between 15 and 30% each. China remained the world's largest buyer of tops, though imports into that country fell by about one-eighth last year to some 27 million lbs. Australia's wool cheque for the first eight months of the current season was £201 million, or £57·8 million more than for the same period last season. Bigger sales and a sharp rise in the average price are believed to have been the cause of this increase.

"Australia now rides upon the sheep's back more than ever. Twenty years ago wool constituted 38% of our export income, and today it is 48%." This was stated at Prospect, New South Wales, by Lord Casey when he opened the Ian Clunies Ross Animal Research Laboratory. The laboratory, established as a memorial to the late Sir Ian Clunies Ross, will serve as the headquarters of the animal physiology division of the Commonwealth Scientific and Industrial Research Organisation. W. A. Gunn (chairman, Australian Wool Bureau) expressed the gratitude of woolgrowers for the foresight of Sir Ian. Some years ago, he said, many woolgrowers had been unconvinced by Sir Ian's arguments in favour of a huge national wool research programme. Now they had been converted to his point of view. Woolgrowers would shortly consider their position on the continued subsidy of research and he hoped that in the next few weeks it would be possible to state that scientists need have no fear of lack of support from the industry.

Stocks of wool tops in the U.K. at January 31 are reported at 74·8 million lbs., one of the highest totals of recent years and 18 million lbs. more than at January, 1959. Of this increase, 17 million lbs. are in merino qualities, which totalled 55·3 million lbs. at January last. Wool stocks in the U.K. at January 31 showed the expected seasonal increase compared with a month earlier although, at 258·8 million lbs. (clean weight), the total was fractionally below that of a year earlier.

Jute Fibre, Yarns and Fabrics

Raw jute markets in Pakistan have become steadily dearer especially the lower grades of long jute and cuttings. Offers of lower grades have not been freely made but the firmer position has not brought out a great deal of buying and spinners have only covered immediate requirements. U.K. spinners still hold fair stocks of raw material and there is no need for panic buying. It is quite possible that prices of raw jute from the present crop will continue very firm for some time yet but once offers of new crop are being freely made, values could decline to a more realistic level.

On the other hand, it is known that Continental countries and also the U.K. still have to purchase a fair quantity of jute from the present crop and there may be a shortage of certain grades before the end of the season. Dundee spinners purchased a considerable quantity in excess of their consumption last season and due to the present dearer trend in prices it is expected that less will be purchased and the stocks held will be reduced until material from the next crop becomes available.

Since the start of the present jute season on July 1, 1959 to March 15 the registered sales of raw jute to the U.K. have been

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597,579 bales as compared with 743,327 bales for the corresponding period of the previous season. On the other hand India has considerably increased her intake of Pakistani jute this season, the quantity being 565,020 bales as compared with 188,489 bales in season 1958-59. The total sales of raw jute by Pakistan from July 1 to March 15 this season are 3,808,848 bales as compared with 3,627,164 bales in season 1958-59.

The bulk of jute purchased by India from Pakistan has been cuttings but this has strengthened the market for the lower qualities and there is a strong possibility that further supplies will have to be secured during the next two or three months.

This excess demand for the lower grades has narrowed the price margins between top and bottom qualities. Mill Firsts are available at £113 10s., Mill Lightnings at £103, Mill Hearts at £96 10s. and grade Hearts at £87, c.i.f., U.K., for April/May shipment. Grade Tossa-2/3 was offered at £111 10s. and grade Tossa-4 at £102 10s. with Continental Tossa-2/3 at £97 10s. Crack Daisee-2/3 was at £101 with grade Daisee-2/3 nominal at £94, April/May.

Many shippers were asking up to £4 per ton more than the above rates and prices have been very irregular of late. This is due to holders of secured parcels discounting the market for afloat and early shipment jute.

Some sellers are now considering the new crop position and offers of a full group of Mill Lightnings are being made at £98 and Mill Hearts at £88 for Aug./Sept. shipment but spinners generally are not interested as they prefer to purchase named marks. Reports regarding the new crop are now more satisfactory and sowing is proceeding. Lack of rain has delayed this operation and it is possible that completion of sowings will be about three weeks later than usual.

Due to the recent dearer raw jute markets it was necessary to raise prices of most yarns in the U.K. on March 17 by approximately £5 per ton. Corresponding increases were also made in cloth prices. This increase in prices was expected and buyers of yarns and cloth have been purchasing fairly steadily of late. Producers are busy and have little to sell in the near delivery position. The wide cloths in particular are very difficult to obtain with manufacturers fully booked for several months ahead. The heavy end of the trade has remained remarkably busy for the time of year but there has been a dearth of orders for narrow widths but this is now improving. Spinners generally have orders in hand for forward delivery and a small but steady business continues to take place.

Taken overall the Dundee jute industry has not been so well placed at this time of year for a long time. Demand for carpet backings and linoleum hessians has been good and there are no signs of any slackening of orders. Usually by this time of year the position in Dundee becomes very quiet but at present the outlook for the immediate future is bright. Stocks of manufactured goods held by producers are practically nil and consumers are having to purchase for forward delivery.

Although the raw jute markets in Pakistan have become much dearer of late, the Calcutta goods position has remained quiet. Little change has taken place in prices and fluctuations have been small. Buyers in the U.K. have shown a good deal of interest and a fairly steady movement has taken place. Quotations are at 62s. 6d. for 10 oz. 40 in., and at 48s. 6d. for 7½ oz. with 11 oz. 45 in. 68s. 6d. per 100 yards f.o.b. Calcutta for April/June shipment. B twills were at 170s. 3d. April/June.

The flax trade in Scotland is busy. Business now being placed is considerably less than previously but both spinners and manufacturers are fully employed for delivery several months ahead. Lack of sufficient labour is preventing a further expansion of output. The raw material markets are steady but not much buying is taking place at present as spinners are already holding large stocks. An unusual position has developed with prices of Belgian flax now cheaper than those of Soviet flax. Practically no Soviet material is available at present.

Yarn and Cloth Deliveries Lengthening

Lancashire spinners and manufacturers find demand fairly well sustained despite the unsettling effects in the middle of March of some price reductions in Sudan cottons and lower Liverpool quotations for some American staples. Some revision has been needed in ruling yarn and cloth prices but the differences have had little effect on the persistent inquiries for yarn and cloth. Some manufacturers are anything but satisfied with the prevailing tone of the market. To those who have had their regular types of yarn cut-off by decisions of firms determined to scrap, it is no easy matter to adjust conditions to prevailing circumstances. Some knitting firms are already finding that the qualities they have so long been accustomed to receiving are no longer available, although in many cases the firms now supplying them are striving really hard to give them what they want. It will be a long time before the full effects of the scrapping and modernisation plan are completely eliminated and traders are once more fully conversant with everything in their particular spheres of activity.

The market has dealt in every count and quality available. Most business has centred around standard weaving counts in twists and doubling wefts on cone, cheese, cop, hank and ring beam. Few complaints are heard these days about margins; most worries are connected with present and future deliveries. It is tragically paradoxical to see the revived interest in mule spun combed yarns now that many of the spindles for these specialities have been so ruthlessly scrapped. Coarse yarns—mule and ring—are in exceptionally good demand and condenser types are eagerly sought. Many in the trade are still firmly convinced that the scrapping programme has gone much too far. It is argued that some measure of control would have achieved a far better result without anything like the present chaotic conditions. One fact, however, is inescapable. Success of the whole scheme depends largely on sufficient labour to run at least two shifts—and where possible, three. Even then the prices of yarns and fabrics must be lower than they are now. Unless these aims are fully realised the whole effort will have been wasted.

Demand for cloth follows recent trends. A large volume of apparel cloths have been transacted and there is much more business than appears on the surface. Dress fabrics in attractive dobby and jacquard designs in many colour variations have found ready buyers. There is now more interest in all cotton types woven and printed and a large proportion of the business has also concerned filament and staple rayons, nylon, "Terylene" and mixture cloths. Furnishing fabrics are in extremely good demand in printed and colour woven novelties. Accent in all cases is on the earliest possible delivery but times seem to lengthen appreciably each week. Household fabrics follow the same pattern of demand. Towellings, sheetings and quiltings are being practically "chased" by buyers eager to ensure adequate supplies over the next few critical months. Export business is also a little better but prospects overseas are still rather bleak.

Silk and Man-Made Fibres

Activity in the silk and man-made fibre sections of the industry is very good with yarn deliveries at a high level. Already in the Midlands complaints are voiced at the inability of Lancashire spinning concerns to deliver the quantities of yarn required for the hosiery trade in what is considered satisfactory time. Lancashire manufacturers are absorbing steady quantities of acetate yarns for the dress goods trade and volume of filament acetate cloth sold since the turn of the year is probably greater than for any corresponding quarter since the end of the war. Printed dress fabrics are in great demand, especially those with the new reactive dyes, which impart a very rich appearance by use of dull shades and contrasting bright colours on the same fabric. The demand for furnishing fabrics is far better than for a long time. All cotton cloths in smart dobby and jacquard designs are in excellent request. Roller and screen printed fabrics in traditional and contemporary styles are selling well and duplex printed cloths on fancy weaves find immediate buyers. Filament and staple rayon more than holds its own in present markets.

Yorkshire sections are also busy and in both woollen and worsteds there is a continuing demand for fabrics of "Terylene"/wool blends.

Dyeing and finishing firms in the Leek area are not quite as busy as they might be. Business has slackened off and the effects of the reorganisation in Lancashire may have much to do with this. Printing concerns remain very busy. Promising conditions are reported in the smallwares section, apart from overseas markets where restrictions considerably retard trade and prospects.

In practically all sections of Midland trade firms are under high pressure from existing orders. New business is also coming in to a greater degree than anticipated at the beginning of the year. Warp knitted specialities are in eager request and production all round would be much higher if more labour was available. Competition is reported from European countries, chiefly Italy, especially in high-class knitwear but prices are very high to maintain the sales to reasonable figures. In ladies' hosiery there is little likelihood at present of fully fashioned ousting seamfree.

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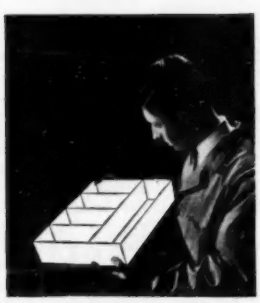

He agrees

As a boxmaker he knows what "Thames Board" means to good packaging. The cartons and boxes which he makes may be taken for granted, but they are the economic, protective packaging essential to modern marketing.

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Notes and News

New Crane System

A new type of overhead crane system will be shown by British MonoRail Ltd. at the Mechanical Handling Exhibition at Earl's Court, May 3-13. The new cranes consist of two or more parallel British MonoRail runways, usually attached to convenient roof members, covering the length of the area it is desired to service, and spanned by a bridge attached to trolleys running on the lower flanges of the runways. The bridge which can be up to 200 ft. long covers the width of the area, and carries crane hoists of up to 5 tons capacity attached to trolleys running along the bridge rail. The cranes are fully motorised, and longitudinal movement of a load is achieved by moving the bridge along the runways, while for transverse travel the hoist is driven along the bridge rail. These new cranes have been specially designed to occupy minimum headroom so that they can be installed in existing buildings where headroom is limited without major structural changes.

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New Products at Mechanical Handling Exhibition

A gravity powered conveyor that can be tailor-made to suit the requirements of industry will be shown by the Dexion Group at the Mechanical Handling Exhibition, May 3-13. The Glidewheel conveyor is built of Dexion slotted angle, punched strap and smooth-running Glidewheels, and needs only a shallow fall to operate efficiently. Glidewheel units can be rapidly erected by Dexion construction teams or by the user. If production plans change, the installation can be easily dismantled and re-erected elsewhere. Also being shown at the exhibition will be the Dexion Group's new open steel plank which, in conjunction with slotted angle or conventional materials can be used for flooring, ramps, or access platforms. Galvanised Dexion slotted angle, for use outdoors, or in corrosive atmospheres will also make its first appearance at the exhibition.

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Electrically-Heated Carpet and Underlay

To illustrate and emphasise the importance of modern floor warming, a carpet with what is claimed to be the world's largest electrically-heated underlay has been prepared for the Electrical Engineers' Exhibition at Earl's Court, April 5-9. The Thermalay electrically-heated unit to be used will be 120 ft. long by 9 ft. wide, overlaid with a "York" quality carpet. The total length of heater cable will be in the order of 7,000 to 8,000 ft., and the total loading in the order of 12,400 watts (approx. 44,000 B.T.U. per hour).

By the all-over floor warming the radiation is in a vertical position giving comfort conditions all round, and makes the whole room available in comfort level. A further advantage cited is that the same comfort level can be maintained for half the power input, the reason for this being, primarily, that the all-over radiation from the floor gives direct heating to the objects instead of relying on the heating of air to transfer the warmth to the object. The heating unit is made by Thermalay Ltd., Shelf Mills, Shelf, nr. Halifax, Yorkshire, and the carpet by John Crossley and Sons Ltd., Dean Clough Mills, Halifax.

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British Imports Show Rise in Wool Values

Wool imports into the U.K. during January were valued at £17·6 millions, compared with £15·1 millions in January 1959, an increase of £2·5 millions. These figures reflect the higher average price of raw wool during the past year for the January quantity was 79 million lbs. compared with 84·4 million lbs. a year ago. Value of U.K. wool textile exports (including tops) during January was £11.9 millions, some 16% more than for January 1959.

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New Phenol Plant at Grangemouth

The new £4 million synthetic cumene-phenol plant which British Hydrocarbon Chemicals Ltd. announce as "on stream" is the latest result of the combination of D.C.L.'s knowledge of chemicals and the refinery experience of B.P. The process used for the conversion of cumene to phenol was developed some twelve years ago by the D.C.L. Research Establishment at Epsom. Plants have now been completed, or are under construction, in Belgium, Canada, France, Germany, Italy, Japan and the U.S.A., and it is estimated that by the end of next year some 200,000 tons of phenol will be manufactured annually by this method. Owing to the rise in the U.K. demand for phenol over recent years, it was decided to supplement the production of existing factories by a plant at Grangemouth, using the up-to-date equipment which the cumene-phenol process requires, producing synthetic phenol at the annual rate of some 13,000 tons. D.C.L., incidentally, uses large quantities of this chemical for the manufacture of plastics materials.

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New Zealand Cuts Imports

The National Wool Textile Export Corporation announces a further curtailment in wool cloth imports by New Zealand this year. "Present restrictions on the import of wool cloth in New Zealand," states the Corporation, "were started in 1955, just prior to the wool textile tariff enquiry, the report of which is still awaited. Since then they have progressively increased in severity and the point has now been reached when the local mills cannot make and sell enough to fill the gap caused by reduced imports. As a result, consumption of wool in New Zealand has declined. In spite of this, the New Zealand import programme for 1960 provides for a reduction of 25% in imports of wool cloth, even though the balance of payments position of the country has improved sufficiently to allow increased imports of several commodities, as well as the limited import of some which hitherto have been under import embargo."

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I.C.I. to Increase "Topane" Production

I.C.I. are stepping up production of "Topane" and "Topane" WS, their brands of ortho-phenylphenol and sodium orthophenylphenate. Considerably increased "Topane" production and the commissioning of a new plant for "Topane" WS are being made possible by I.C.I.'s expanding production of phenol, to which the manufacture of the "Topane" products is allied. "Topane" and "Topane" WS are stated to be extremely potent disinfectants and excellent agents for the prevention of mould and fungal attack in a broad range of materials. They are, moreover, efficient at economically low concentrations and are practically odourless. "Topane" can be applied in a very practical manner by solution in organic solvents and in animal and vegetable oils, whilst "Topane" WS, the sodium salt, is complementary in that it is highly soluble in water. "Topane" WS is manufactured in technical and refined grades. Typical applications for these versatile materials are the prevention of rot and sapstain in timber, "red heat" in leather, and of mould and rot in building products and textiles, including rope.

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Floor, etc., Cleaner

Supplied in powder form by Liverpool Borax Co. Ltd. (Andrew Maxwell Division), St. Paul's Square, Liverpool 2, Volvite floor cleaner effectively removes grease, oil and dirt deposits also foreign matter from factory, warehouse and canteen floors, transport bays, garage floors, etc. It also cleans paint, tiles and other surfaces including plant, equipment and machinery, etc. In 7-lb. bags, 28-lb., 56-lb. and 1-cwt. bags. Further particulars will be gladly sent to any reader without obligation.

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Russian Journals

Scientists and students frequently have difficulty in tracing accessible published Russian literature and, with their needs in mind, a union list has been compiled. Russian scientific and technical periodicals held by Manchester Central library, Manchester College of Science and Technology library, Manchester University library and the library of the Royal Technical College, Salford. Altogether, 54 titles are recorded of which 22 are translations. The list has been compiled for the Library Association (Reference, Special and Information Section, North Western Group) by Mr. G. Hill (Manchester College of Science and Technology library) and is in alphabetical order of the Russian title. There is a full index under transliterated and translated titles. Miss B. M. Walker, M.A., Central library, Manchester 2, will gladly send copies to readers of "Textile Manufacturer" who wish to have this useful list.

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U.K. Wool Textile Exports

United Kingdom wool tops exports in January and February totalled 18 million lbs. compared with 14·5 million lbs. in the corresponding period of 1959—a record year for tops exports. China took nearly 2 million lbs. of tops from Britain last month and is now our best market for tops, Canada and India being second and third respectively. Woollen and worsted fabrics exports during the two months totalled 18·4 million sq. yds. compared with 16·9 million sq. yds. in January-February 1959. About 28% of February shipments

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SINCE 1846

James Mackie & Sons Ltd

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NORTHERN IRELAND

CARPETS

S 6.

went to the U.S.A. With exports to Canada added more than 40% of last month's British wool cloth exports represented dollar earnings.

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Jute Firms Amalgamate

The directors of Don Brothers Buist and Co. Ltd., and of Low Brothers and Co. (Dundee) Ltd. announce the financial merger of their companies. With the problems in the jute industry brought about by successive reductions in protection, the two concerns have felt that they should strengthen their position by this arrangement. An exchange of directors between the companies has been agreed upon and under the new arrangements the present managing directors of both companies continue in office.

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Anti-Static Agent

Cithrol A, a non-ionic surface active agent, is claimed to have first class anti-static properties. For many years Croda Ltd., Cowick Hall, Snaith, Goole, have been manufacturing this light brown oily liquid and selling it

Anti-Static

as an oil-in-water emulsifier and textile anti-static agent.

The company now announce that Cithrol A is available in an aerosol container. This means that it can now be sprayed by hand on to natural and synthetic fibres when and where static electricity occurs in the processing. In effect, it serves as an on-the-spot killer of static electricity.

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Procion Blue 3RS

The importance of this new "cold-dyeing" type homogeneous dye lies in the fact that, because of its excellent fixation and building-up properties, it now becomes possible to obtain navy blue shades with Procion dyes on cotton, viscose rayon and linen goods. It also proves valuable for the production of many mixture shades, including greys, particularly where a blue component of improved fastness to chlorine liquors and burnt gas fumes is required. Useful dark greens are obtainable from Procion Blue 3RS in conjunction with Procion Yellows. The new dye is considerably more economical in use than earlier Procion blues. The general fastness properties of Procion Blue 3RS are good, the only cautionary note being that medium- and heavy-depth shades must be washed off very thoroughly because of the comparatively high affinity (for a reactive dye) possessed by the new product.

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New Range of Materials Handling Aids

A wide range of new handling aids is being introduced to the materials handling field by a company entering this market for the first time. The company is J. E. Shay Ltd., Basingstoke, a subsidiary of Lansing Bagnall Ltd. The "Shay range" will include a new well designed and styled hand stacker, with optional manual or electric hydraulic lift, aimed at bringing the best materials handling practice within the reach of all concerns, small or large. Shay are well known. Their precision engineering and hydraulic divisions are among the finest in the country and their range of handling aids will be sold and serviced through the Lansging Bagnall organisation, and other selected agents.

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Hydraulic Equipment

The Technical Committee of the Association of Hydraulic Equipment Manufacturers recently held a meeting to conduct investigations into some of the technical problems of the hydraulic industry and sub-committees have been organised to examine the following:—

(1) Hydraulic and fire-resistant fluids.
(2) Cylinder bore and rod: dimensions, materials and finish.
(3) Pipe couplings: dimensions and methods of sealing.
(4) Symbols and terminology.
(5) Equipment performance, testing and specifications.
(6) Standardisation of the inte:change-ability of equipment.
(7) Standard instructions for use and maintenance and delivery and guarantee.

The Technical Committee welcomes the participation of any manufacturer or Association with specific interest in any of these problems.

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International Rubber Conference

Synthetic rubber and synthetic fibre for the rubber industry will be in the foreground of the International Rubber Conference to be held this year October 4 to 7 at the Berlin Congress Hall. Experts from thirty nations will join in a worldwide exchange of experiences concerning recent scientific developments. The subjects to be dealt with will include problems covering the chemical, physical and technological aspects of synthetic rubber and synthetic fibre developments for application in the rubber industry, also testing methods. The organisation of this conference is in the hands of Deutsche Kautschuk-Gesellschaft, a scientific association of chemists, physicists and engineers concerned mainly with the promotion of rubber research.

New Companies

Mohair Export Ltd. Private. Reg. Jan. 18. Capital £1,000 in £1 shares. Wool, top, noil, and waste merchants, top makers, spinners, etc. Reg. office: Royal Chambers, Upper Piccadilly, Bradford.

Exquisite Fabrics Ltd. Private. Reg. Jan. 19. Capital £1,000 in £1 shares. Manufacturers and dealers n jersey cloth, etc. Registered office: 101 Hatt m Garden, E.C.1.

Pickup and Nicholson Ltd. Private. Reg. Jan. 20. Capital £1,000 in £1 shares. Textile merchants, manufacturers, wholesalers, converters, retailers, etc. Registered office: Khyber Street, Colne, Lancs.

Richards, Bennett and Rivers (1960) Ltd. Private. Reg. Jan. 20. Capital £2,000 in £1 shares. Warehousemen, manufacturers, agents, silk mercers and weavers, etc. Registered office: 22-23 Watling Street, E.C.4.

Rotproofing (Textiles) Ltd. Private. Reg. Jan. 22. Capital £2,000 in £1 shares. Registered office: 173 Russell Court, Woburn Place, W.C.1.

Continental Textile Printers (Fred. A. Rueef) Ltd. Private. Reg. Jan. 25. Capital £1,000 in £1 shares. Solicitors: Wells and Hind, Nottingham.

Stephen Pickles and Sons (Barnoldswick) Ltd. Private. Reg. Jan. 27. Capital £10,000 in £1 shares. Textile manufacturers and haulage contractors. Long Ing Shed, Barnoldswick, Yorks.

North West Wool and Trading Co. Ltd. Private. Reg. Jan. 28. Capital £500 in £1 shares. Waste merchants, manufacturers and dealers in waste products, shoddy, textiles, etc. Registered office: 2 Elmwood Drive, Heswall, Wirral, Ches.

Donald Straw and Co. Ltd. Private. Reg. Jan. 29. Capital £20,000 in £1 shares. Exporters, importers, manufacturers and dealers in textiles, etc. Registered office: Rhodesia House, 4th Floor, 52 Princes Street, Manchester 1.

British Northrop Sales Ltd. Private. Reg. Jan. 29. Capital £10,000 in £1 shares. Textile and other machinery merchants, etc. Registered office: Daisyfield, Blackburn.

John Humphrys and Co. (Textile Machinery) Ltd. Private. Reg. Jan. 29. Capital £1,000 in £1 shares. Manufacturers and dealers in textile and hosiery accessories, plant, machinery, etc. Registered office: 2 Prince Street, Oldham.

Charles Hahlo and Sons Ltd. Private. Reg. Feb. 1. Capital £40,000 in £1 shares. Iron founders, mechanical engineers and manufacturers of textile machinery and spares, tool makers, etc. Registered office: 17 Canal Road, Bradford.

J. and H. Fisher Ltd. Private. Reg. Feb. 1. Capital £100,000 in £1 shares. Worsted spinners. Union Mills, Idle, Bradford, Yorks.

Berican Textiles Ltd. Private. Reg. Feb. 1. Capital £500 in £1 shares. Manufacturers and dealers in cloth, wool, worsted, etc. Solicitors: H. Collinson and Co., 27 Harrison Road, Halifax.

G. Gillingham Ltd. Private. Reg. Feb. 1. Capital £2,500 in £1 shares. Manufacturers and dealers in wools, yarn, etc. Registered office: 431 Locking Road, Weston-super-Mare.

Reagher Ltd. Private. Reg. Feb. 8. Capital £1,000 in £1 shares. Merchants, manufacturers and makers up of cotton, linen, woollen, silk, and other textile goods, etc. Registered office: 3 York Street, Manchester 2.

Thornton-Jones Worsteds Ltd. Private. Reg. Feb. 8. Capital £1,000 in £1 shares. Manufacturers and dealers in textile piece goods of all kinds, etc. Registered office: 3 Piccadilly, Bradford.

Rodley Warping Co. Ltd. Private. Reg. Feb. 9. Capital £500 in £1 shares. Solicitors: Emsley and Son, Atlas Chambers, King Street, Leeds.

M.M. (Yorks.) Ltd. Private. Reg. Feb. 10. Capital £1,000 in £1 shares (250 preference, 250 "A" ordinary and 500 ordinary). Yarn spinners, operated formerly as Pogson and Co. Ltd., at Bridge Street Mills, Slaithwaite, nr. Huddersfield. Registered office: 35 Westgate, Huddersfield.

Eric Corner Ltd. Private. Reg. Feb. 15. Capital £5,000 in £1 shares. General engineers, textile machinists, jig and machine tool manufacturers, etc. Registered office: Dominion House, Whitworth Street, Manchester.

Sylvan Fabrics Ltd. Private. Reg. Feb. 17. Capital £1,000 in £1 shares. Manufacturers and dealers in knitwear and fabrics. Registered office: Sylvan Avenue, Prospect Hill, Leicester.

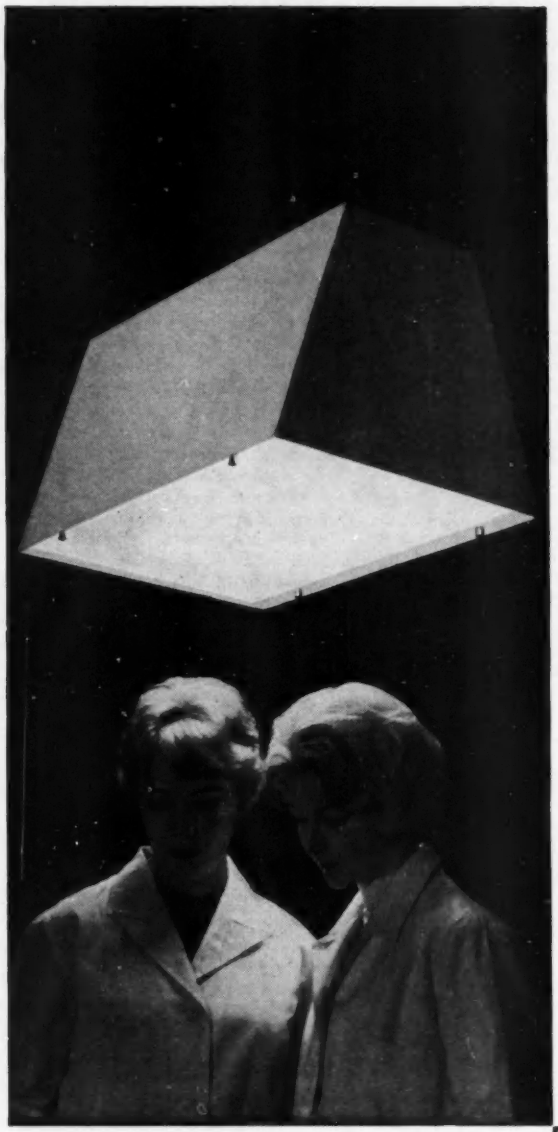
S. and F. Textiles Ltd. Private. Reg. Feb. 18. Capital £1,000 in £1 shares. Cotton and other yarn doublers, twisters, etc. Registered office: 5 Cater Street, Bradford.

Kingswood Worsted Manufacturing Co. Ltd. Private. Reg. Feb. 22. Capital £2,000 in £1 shares. Registered office: 5 East Parade, Leeds 1.

Franken-Lockwood Ltd. Private. Reg. Feb. 23. Capital £5,000 in £1 shares. Cloth merchants, converters, etc. Registered office: 21 Lever Street, Manchester 1.

Hutman (Successors) Ltd. Private. Reg. Feb. 24. Capital £1,000 in £1 shares. Manufacturers and dealers in all kinds of fibres, wool, cotton, silk, etc. Registered office: 50 Bland Street, Moss Side, Manchester 18.

Ingham and Lee (Heasandford) Ltd. Private. Reg. Feb. 24. Capital £6,000 in £1 shares. Manufacturers and dealers in textiles of all kinds, etc. Registered office: Heasandford Mill, Burnley.



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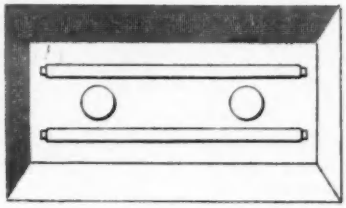

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RECENT TEXTILE PATENTS

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809,958 Metallising Synthetic High Polymer Fibres

DEUTSCHE GOLD-UND SILBER SCHEIDEANSTAUT VORMALS ROESSLER, 9 *Weissfrauenstrasse, Frankfurt, Main* 1, *Germany*.

A process for applying metal coatings to fully synthetic high polymer fibres by vapour deposition *in vacuo*. The fibres are treated before or after the deposition of the metal with an agent which makes the fibres resistant to swelling or water repellent. In one example a silicone is applied to the material from a solution of methylene chloride with a concentration of 5%. The drying is carried out after the material has been wrung out and at a temperature of about 100°C. The fabric is vapour-coated with aluminium by passing a moving band of the fabric through an evacuated vessel supplied with aluminium vapour. The metal coating proved to be exceptionally firmly bonded and is resistant to all normal stresses, particularly those caused by washing.

809,959 Overcoming Weak Pick in Weaving

HOLDING LUXEMBOURGEOISE METAPIC S.A., 144 *Rue de Hollerich, Luxemburg*,

Apparatus for starting looms without a weak pick, that is, the first or starting pick is practically the same as the pick in the normal operation of the loom. The apparatus provides for assisting the driving member of the loom at the time of the first throw, but which reduces or withdraws this assistance after starting. The loom is driven from a shaft fitted with a flywheel which is movable relatively to the drive shaft and is coupled by a driving connection which enables the flywheel to overrun and drive the drive shaft at the time of starting the loom.

810,016 Condenser Rubbing

DAYTON RUBBER CO., 2342 *Riverview Avenue, Dayton* 1, *Ohio, U.S.A.*

Relates to rub aprons which are employed in carding or condensing machines. The apron is composed of an elastomeric matrix material having dispersed in it particles, of rounded or spherical shape. The fibre contacting surface of the apron is free of such particles and has voids having the shape of at least segments of the particles and conforming to the cavities remaining in the surface after removal of those particles formerly in it.

810,040 Fibre Dressing Solutions

SPINNFASER AKT. GES., *Kassel-Bettenhausen, Germany*.

A process for dressing artificial filaments or fibres in which they are in a first stage treated with an oil-in-water type emulsion containing 0·1 - 0·2 grams per litre of a liquid dressing agent of oil consistency, which constitutes the dispersed oil phase of the emulsion. The proportion of agent necessary to complete the desired dressing is applied in the form of an oil-in-water emulsion containing 70 - 200 grams per litre of the dressing agent which constitutes the dispersed oil phase of the emulsion in a second stage after the moisture content of the filaments or fibres has been reduced by squeezing or centrifuging. The moisture content may be reduced still further before the second stage by drying after the squeezing or centrifuging. In one example, a regenerated cellulose staple fibre fleece is sprayed at 50 - 60°C. in a final after-treatment step with an emulsion containing 0·1 to 0·2 g. of dressing agent per litre to give a take-up of dressing agent of about 0·02% of the weight of the dry fibres. This dressing agent is a mixture of 40% by weight of "SOROMIN" and 60% by weight of "PRAKALIN." The fleece is centrifuged to a moisture content of 120 - 130% and dried without interposition of a humidifying zone. After leaving the drier, the fleece is sprinkled with an emulsion of the dressing agent which is at room temperature and contains 70 g. of dressing agent per litre. 500 Kg. of fibre leave the drier each hour, and 23·3 litres of dressing emulsion are sprayed on it, whereby the moisture content is raised from 6% to 11% and a coating of dressing agent in an amount of 0·35% by weight, based on the weight of fibre, is produced.

810,049 Continuous Rope Washing Machines

JOH. KLEINEWEFERS SOHNE, *Kleinewefer-Strasse, Krefeld, Germany*.

A continuous rope-washing machine comprises at least one row of J-shaped chambers with wringing and feed rollers between them, in which water flows successively through each of the chambers in the row and on leaving one chamber flows directly into the next. The material passes through each chamber in a direction opposite to that of the flow of the water and passes through the chambers in an order which is exactly the reverse of the order in which the water flows through the chambers. Each chamber is provided with a folding unit by which the material is folded into zig-zag form, immediately on entry into the chamber. The material when passing through the machine at a speed of two hundred metres per minute takes at least five minutes to pass through each chamber.

810,172 Yarn Tension Device for Knitting

TEXTILE MACHINE WORKS, *Wyomissing, Berks, Pennsylvania, U.S.A.*

A device for tensioning a sheet of yarns, particularly for use in tricot knitting machines, which is carried on spaced members controlled by resilient means having individual adjustment to permit a uniform tension to be exerted on all of the yarns.

810,209 Fallers on Gill Boxes

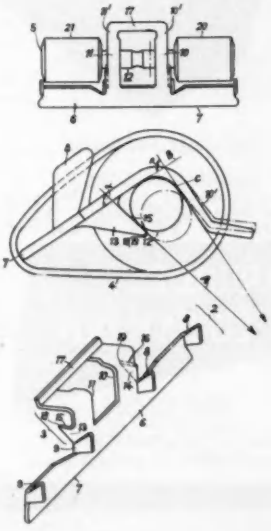
SCHIESS AKTIENGESELLSCHAFT, *of* 289 *Hansa Allee, Düsseldorf-Oberkassel, Germany*.

A faller for use in the formation of a faller bed for a spinning or preparatory machine is in the form of a bar having at least one extending row of equally-spaced pins and a pin-free end portion at each end of the row. The pin-free end portions differ in length from each other by a fraction of the pin spacing of the row, and the lengths are such that by turning the bar through 180° about a given axis of the bar, the effective pin spacing of the faller bed can be varied.

810,269 Drafting Cradle

JOH. JACOB RIETER AND CIE, *Winterthur, Switzerland*.

A cradle for double apron drafting on spinning machines. The cradle is made of one piece and includes an apron guide 2 and a mounting portion 3 for holding the cradle in position on a top roll assembly 5. The guide 2 includes a reversal bar 6 having a front edge 7 which is rounded and on which the run of the apron is reversed, and two pairs of guide flaps 8, 9 which prevent lateral movement of the aprons. The mounting 3 includes two brackets 10, 11 which partly surround the top roll axle 12, each bracket having a rigid axle retaining flap 13 and 14 which prevent the top roll assembly from falling off. Each bracket 10, 11 has a bearing surface in a common plane B and each flap has a surface 15, 16, respectively, positioned in a common plane A, the planes forming an angle a and being absolutely parallel to the front edge 7. Each bracket has a flexible portion 10^1, 11^1, respectively, bent around the axle



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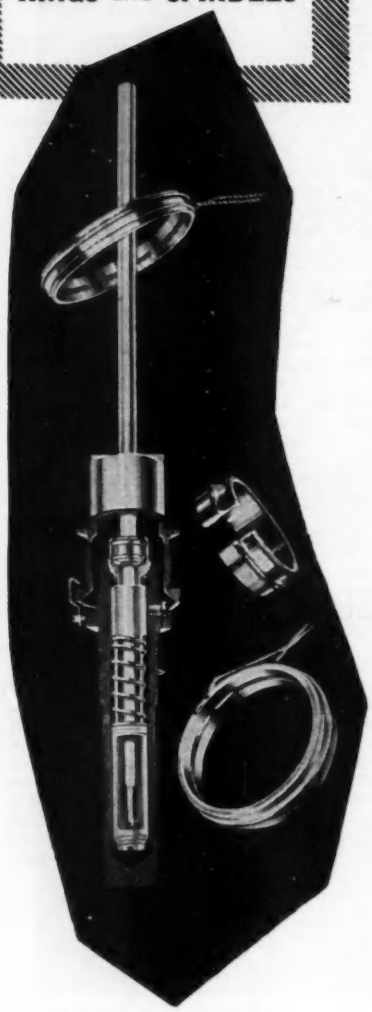

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12 and has an end portion of reduced width connected by a bar 17. In order to reduce undesired friction the portions 10^1, 11^1, are bent at such a distance from the flaps that there is a very small clearance at the part C of the portions 10^1, 11^1. The bearing surfaces 15, 16, make an angle α of about 80° with the plane B of the reversal bar 6, and the undeformed portions 10, 11 and the yielding portions 10^1, 11^1, respectively, make an angle β of about 85°. This structure produces a seating for axle 12 which converges towards the open side of the seating and forms a part-enclosure for the axle. The latter can only be removed from its seating by bending or deforming the portions 10^1, 11^1 until the axle passes the points 18, 19, of the flaps 13, 14, as shown in dash-dot lines. After removal of the axle the elastic portions snap back into undeformed position shown in solid lines. When the aprons 4 are mounted on the top rolls 20, 21, the axle is pulled on to the faces 15, 16 of the flaps 13, 14 and on to the surfaces of the brackets 10, 11 in the plane B by the tension of the aprons.

810,352 Anti-Static Treatment for Undyed Fibres or Fabrics

BADISCHE ANILINE AND SODA-FABRIK AKTIENGESELLSCHAFT, *Ludwigshafen Rhein, Germany.*

A process for preventing or minimising the electrostatic charge of undyed fibres, threads or fabrics, comprises treating them with a quaternary ammonium compound of a polymer prepared from a vinyl compound of a N-heterocyclic compound, the vinyl group being directly attached to a nitrogen atom or a carbon atom of the heterocyclic radical. In one example, 5 parts of the polyquaternary ammonium salt of N-vinylimidazole and dimethyl sulphate are dissolved in 1,000 parts of water and a fabric of a polyamide on the basis of caprolactam is treated at 30° to 95°C. with a goods to liquor ratio of 1:20 or 1:40, squeezed or hydroextracted and then dried at 70° to 100°C. The treated fabric has practically no electrostatic charge.

810,439 Anti-Felting Treatment for Wool

WOOL INDUSTRIES RESEARCH ASSOCIATION, *Torridon, Leeds.*

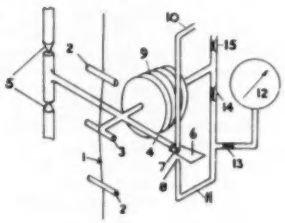
Treatment of wool in the form of fibres, sliver, yarn or fabrics so that the wool has a reduced tendency to felt. The wool is treated with a dilute solution of an organic per acid of the general formula R.CO.O.OH (where R = hydrogen or an alkyl group), or a dilute solution of a per sulphuric acid, or an alkali metal salt of the per sulphuric acid in acid solution with or without an anionic wetting agent, followed by treatment with a solution of a halogen or acidified solutions of a hypohalite of an alkali metal or alkaline earth metal. In one example, 100 parts of a scoured hosiery fabric made from 64s quality wool were treated in 3,000 parts of a solution containing 3 parts of peracetic acid and 3 parts of an anionic wetting agent at 15°C. for 30 minutes. After rinsing in cold water they were treated with aqueous chlorine by adding 3·1 parts of sodium hypochlorite, equivalent to 0·5 part of chlorine, and 8·5 parts of a solution of hypochloric acid (36% w/v) simultaneously, to 3,000 parts of water in 20 minutes, the fabric being moved continuously during the addition. Samples were tested by washing in a domestic washing machine for 1 hour and also by milling for 1,000 blows by the method described in B.S. 1955: 1953, the following results being obtained:—

Test	Felting Shrinkage % Untreated L.	W.	A.	Peracetic acid and Chlorine L.	W.	A.
Washing 1 hour	24·7	6·3	29·4	6·8	—1·9	5·0
Milling 1,000 blows	15·6	4·2	19·1	8·6	—1·5	7·2

810,482 Apparatus for Tension Measurement and Control

LINEN INDUSTRY RESEARCH ASSOCIATION, *Lambeg, Antrim, Northern Ireland.*

Apparatus for measuring and controlling the tension on roving and yarns as they are passed through or delivered from the machines. The yarn bears against two stationary bars 2, 2 and against a light feeler arm 3, which is attached to a light arm 4, freely pivoted at one end, 5, and carrying at the other end, a light vane 6, which is free to move between two orifices 7 and 8. The arm is attached to the end of a sensitive pneumatic bellows or capsule stack 9, and is positioned so that when there is no tension on the yarn 1, the vane is just clear of the opposing orifices. A supply of compressed air at low pressure is supplied through the tube 10, to orifice 7, and thence to orifice 8, which is connected by tube 11, to the pressure gauge 12 and the bellows. A restrictor 13 may be arranged between orifice 8 and the gauge to damp out rapid fluctuations in pressure and a second restrictor 14 may be arranged between the orifice and the bellows. Part



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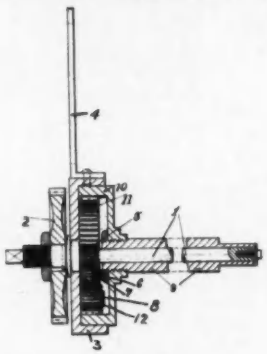
of the compressed air in the bellows may be allowed to escape through a third restrictor 15. Compressed air at about 5 lbs. per sq. inch from the tube 10 flows from orifice 7 to orifice 8 to increase the pressure in the bellows which expands and moves the arm 4 until the vane 6 reaches its equilibrium position in which it partially obstructs the flow of air from orifice 7 to orifice 8, and thence to the bellows, so that the pressure in the bellows exerts a thrust which just maintains the vane at its equilibrium position between the orifices. When tension is applied to the yarn it produces a backwards thrust on the arm 3, which compresses the bellows and allows the vane to move from between the orifices, so that compressed air flows into the bellows which expands until it provides an additional thrust which is just equal to the thrust produced by the yarn, so that the vane is restored to its equilibrium position in which it partially obstructs the flow of air from orifice 7 to orifice 8. In this way the increase in the pressure in the bellows as shown on the gauge is proportional to the tension on the yarn.

810,495 Improved Building Motion for Ring Frames

FETHNEY BROS. LTD., *Wellfield New Works, Woodbine Street, Rochdale.*

An arrangement for use in building ring cops suitable for use in high-speed winding machines, and allowing of winding off at a higher speed than normal cops. The device comprises a spindle 1, on which is secured a ratchet wheel 2, and the spindle rotates in a casing 3 supported by a bracket 4. A pinion 5 is keyed on the spindle and meshes with a pinion 6 on a stud 7, and pinion 6 meshes with a pinion 8 on a stud 12. A hollow shaft 9 is rotatable on the spindle and has fixed to it a plate 10 with an internally toothed flange 11 which



projects into the casing and meshes with pinion 8. Rotation of the ratchet wheel by the usual pawl results in rotation of the hollow shaft in the same direction, but at a reduced speed. For example, if a gear ratio 5:1 is used, a ratchet wheel of 42 teeth will need to be advanced 210 steps to produce one revolution of the hollow shaft, and thus will produce the same effect as a ratchet wheel of 210 teeth used without a reduction gear. The means for driving the chain block for winding the chain which lifts the ring rail is fixed on the hollow shaft.

810,507 Improved Corduroy Fabric

NEW VICTORIA COTTON SPINNING AND MANUFACTURING COMPANY LTD., *Wellington Street, Bury.*

A weft pile corduroy fabric is characterised, in that one or more of the pile weft picks of each group between each two adjacent backing fabric weft picks, are alternately woven with the backing fabric and floated in correspondance with adjacent ribs. One or more other picks of the group are floated and woven alternately therewith, so that these picks are flushed and bound-in alternately in adjacent ribs. Each rib has a minimum of five warp ends, and each of the alternately woven and floated weft pile picks passes from the front to the back (or vice versa) of the backing fabric, a minimum of six times in each pattern repeat.

810,563 Registration Adjustments of a Printing Cylinder

JOH. KLEINEWEFERS SOHNE, *Kleinewefer-Strasse, Krefeld, Germany.*

An improvement in the register producing device in web printing machines as described in B.P. No. 684277, which a wheel is rotated, for registration, relatively to a second wheel on a central driving shaft from which the first wheel is driven. An intermediate shaft is interposed between the register effecting wheel and the central wheel, and the idler wheels of the idler shaft are turned relatively to one another by means of an adjusting gear. The improvement is characterised in that wheels of the adjusting gear are constantly in engagement with the idler wheels of the adjusting gear, and are adapted to be coupled together for registration by a clutch operated by relative axial displacement of the adjusting gear-wheels. The clutch is preferably a Hirth-coupling.

810,564 Heat Treatment of Moving Fabric

H. KRANTZ SOHNE, *Industriestrasse, Aachen, Germany.*

An apparatus for heat-treating a continuously moved web of fabric, comprising chambers above and below the web having nozzles for blowing the heating medium against the web, with the nozzles arranged in successive relation in the direction of movement of the web an extending transversly throughout the width of the web. Blowers above and below the nozzle chambers are provided for feeding the medium to the nozzle chambers with their axes vertical to the plane of movement of the web. An annular diffusor having an increasing cross-section in the direction of flow, surrounds each blower, and is arranged between each blower and the appertaining nozzle chamber concentrically with relation to the blower axis.

810,603 Papermakers' Felts

SCAPA DRYERS LTD., *Cartmell Street, Blackburn.*

A woven fabric for a papermakers' dryer felt consists of "Terylene" and nylon in the proportions between 25% to 75% by weight of either, with or without cotton, or asbestos substituted for some of either the "Terylene" or the nylon in a proportion leaving a minimum of 2% of both. Dryer felts manufactured in this way keep themselves clean during their life on the paper machine compared with dryer felts composed wholly of cotton or "Terylene" or nylon. In one example, the weave structure of the dryer felt is shown. Each of the warp yarns is composed of eight strands of 14s cotton plied with one nylon filament yarn of 210 total denier and one "Terylene" filament yarn of 250 total denier. Each of the weft yarns is composed of nine strands of 7s cotton plied with one nylon filament yarn of 210 total denier and one "Terylene" filament yarn of 250 total denier. There are 63 warp threads per inch and 27 weft threads per inch in the finished felt. This felt is composed of 90·1% by weight of cotton, 4·5% by weight of nylon and 5·4% by weight of "Terylene."

810,673 Improved Dyeing Apparatus

RHODEN DYEING CO. LTD., *Three Brooks Mill, Oswaldtwistle.*

A method of winding yarn on to a dyeing beam in which the tension in the yarn is controlled so that it decreases linearly from a maximum at the core to a minimum at the outside diameter. The means for controlling the tension in the yarn comprises an unwinding beam from which the yarn is wound on to the dyeing beam, a pneumatically controlled brake for the unwinding beam being controlled by tension in the yarn as it winds on to the dyeing beam. The air brake acts on a pair of plates provided with concave friction surfaces which embrace the axle of the unwinding beam.

810,967 Roller Weighting Apparatus

T.M.M. (RESEARCH) LTD., *Hartford Works, Oldham.*

Roller-weighting means for drafting apparatus comprising a sprag pivoted on the roller arm and capable of engagement with a fixed stop to support the arm in the normal inoperative position. Means are provided on the sprag for co-operating with a fixed abutment when the arm is raised above the normal position, so that the sprag is caused to ride clear of the stop on the return movement of the arm towards the operational position. Yieldable means hold the sprag ineffective until it has passed the stop and further means are effective to restore the sprag to its normal condition in readiness for engagement with the stop when the arm is next raised to the inoperative position.

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